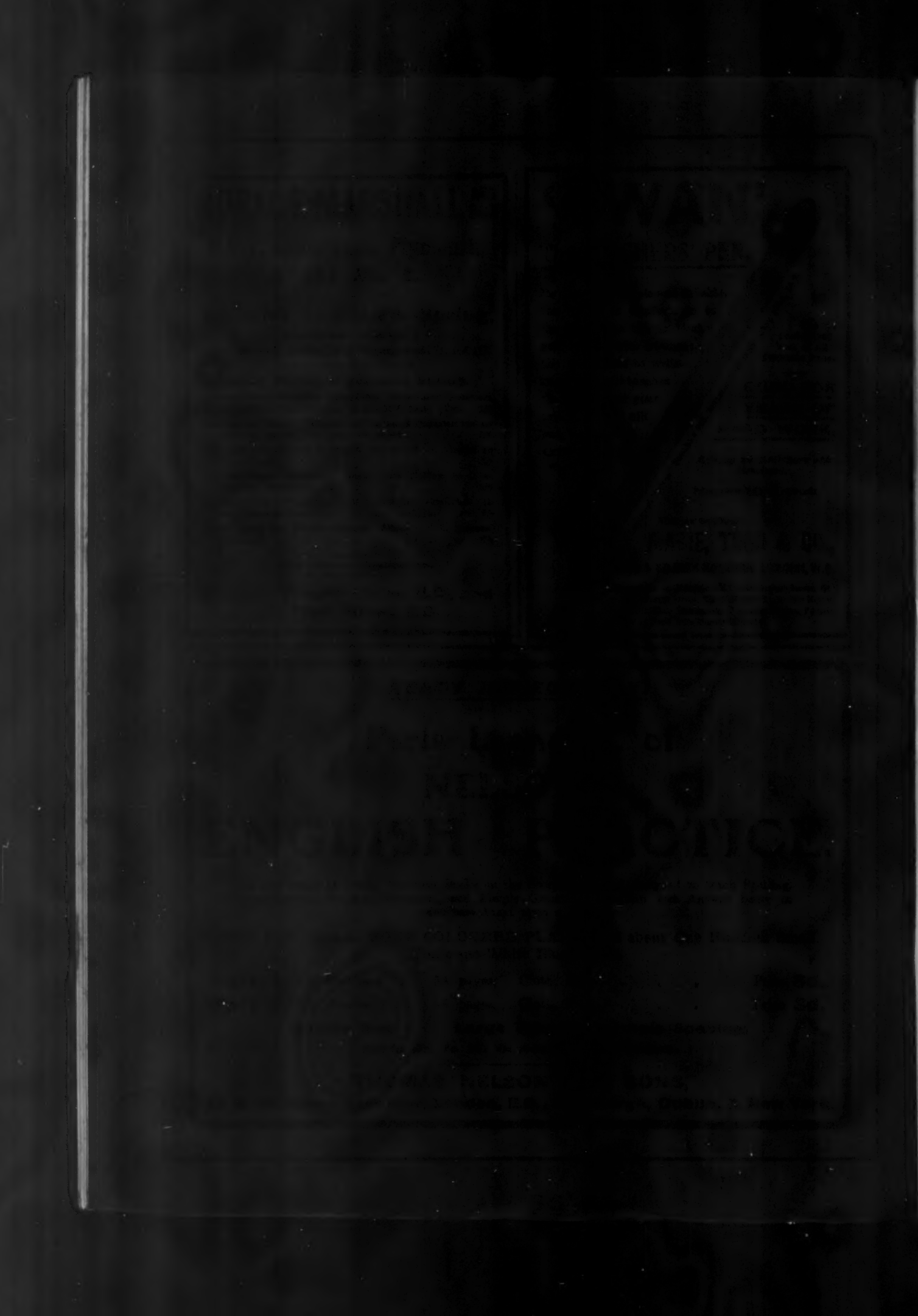

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With which is incorporated

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CONTENTS.

The New Constructive Movement—
- Suggestions from American Schools. By W. H. WINCH, M.A. 568
- Craftsmen or Casuals. By "OBSERVER" . . 569
- A New Course of Practical and Constructive Work. By A. R. PICKLES, M.A., and DALTON GRANGE 571
- The Constructive Movement in Canada. By ALBERT H. LEAKE 573

A New Art for Children 576

Far and Near 579

"Come unto these Yellow Sands." From *The Tempest*. Music by J. BANISTER (1630–1679); arranged for the use of Schools by T. MASKELL HARDY 581

Our Art and Handwork Section—
- An Early Italian Painter—Fra Angelico. By W. E. SPARKES 583
- Honours Page 588
- Editorial Notes 588
- The History Lesson and Drawing. By W. H. ELGAR 588
- The Outlook of Practical Teaching in Schools . 591
- Needlecraft for Primary and Secondary Schools. By ANN MACBETH and MARGARET SWANSON. 593
- Manual Instruction in Secondary Schools . . 597
- Constructive Work in Paper. By AGNES E. FARMAN 598
- The Use of Colour in School. By JOHN YOUNG . 602
- A Page of Seasonal Suggestions 605

Our Needlework Column—
- The Repairing of Garments in Girls' Schools. By J. A. FLEMING 607
- The Use of the Sewing-Machine in School . . 608
- Modern Expert Opinion on the Teaching of Needlework 60

***The Practical Teacher* Technical Scholarships.** A Magnificent Offer to Progressive Teachers.—*See Supplement.*

The "Unlessoned Girl" 610

Christian Names. By RUBY K. POLKINGHORNE 611

Reform in the Geography Syllabus of the Primary School. By C. BIRCHENOUGH . 612

Agricultural Education. By W. FRANCIS RANKINE 614

Practical Notes on School Gardening for April. By BRUCE COOK . . . 617

French Prize Competition 619

Papers for Teachers of Infants—
- A Correlated Scheme based upon Æsop's Fables . 620
- Tutorial Column for the Elementary Certificate of the National Froebel Union 621
- Scripture Lessons for Young Children. By Mrs. FLORENCE KIRK 622

N.U.T. Notes. By ALLEN CROFT . . . 624

An Eminent Physicist 624

A Scheme of Correlated History and Literature. By MABEL A. BROWN . . 625

Modern Science Notes. By J. G. M'INTOSH, B.Sc.—"The Tail of a Comet"—The Properties of Polonium—The New Method of Electroplating 626

Our Query Column—
- Replies to Enquirer—Comus—Maths—Fiat Lux . 628

The New Constructive Movement.

SUGGESTIONS FROM AMERICAN SCHOOLS.

BY W. H. WINCH, M.A.

SEVERAL teachers who read my article in the March issue have since spoken to me about what I called the principal difference between the American ideal in drawing and constructive work and our own.

They suggest that the English ideal, as put before them by some of the officials of our own Board of Education, has now out-Americaned the American. They are told, they say, that they are wholly to rely on the spontaneous activities and interests of the child. If these are provided with suitable occupation, all will come right—the child will not only be pleasantly, and indeed enthusiastically, occupied, but will grow, slowly, perhaps, but still surely, to the standard of dexterity required by the adult mechanician of to-day, or, better still, of to-morrow. The teachers assert that their experience is against the whole-hearted adoption of these principles, and ask me to point out just where and how far spontaneous interest and spontaneous development may be relied on; how far it may not. They ask also where the teaching comes in, and how the psychology of the matter really helps the teacher. All these questions I hope to answer, probably in subsequent articles on the principles and methods of the New Constructive Movement, or in some other way. But it would lead me too far astray just at present, and prevent me from continuing the sort of object-lesson teaching in constructive work which we can obtain from American schools.

I have been questioned also about the *variety* of American work. In so far as manual work is definitely organised at the upper end of American senior schools, it can claim no greater variety of achievement than our own. I have already said the execution is inferior, but it is the question of variety which I ask you to consider to-day.

Many American education authorities establish in summer a kind of half-way house between play and school, called a vacation school. In these, variety is undoubtedly to be found. In democratic countries, like England and America, it is usual for educational experiments to be made in this semi-public, optional way, without interfering with the general compulsory system. Much may be learnt from them, even when they fail. One word, however, of caution: the American vacation school lasts for a month or five weeks in the middle of a vacation which is never shorter than *eight* or *nine* weeks, and which is sometimes *ten* or *eleven* weeks in length. An American would smile if one urged with any emphasis the necessity for vacation schools in a country where, as in our own, the summer holiday lasts *four* weeks. So that, though I think we may find American vacation schools interesting, it will not be—unless we are going shortly to lengthen our summer vacation—because any considerable number of vacation schools will be established here. To me, at least, and probably to some of my readers, who, in the month of August, have found themselves in American cities where vacation schools exist, the *variety* of the drawing and constructive work was the characteristic which forced itself into notice.

The following illustration of the making of a design for ornamental purposes will be valuable as showing us what to avoid, as well as being suggestive of improvements on itself. Starting from a "natural" form, the class was supposed to work towards a conventional form for ornament, derived, of course, from the natural form.

Only a few years ago the greater part of our so-called higher work in the drawing of elementary schools was known as design. The question, What for? was fatal to much of it, for the children did not know. And a further question, Why do you select the convention which you have adopted from among other possible conventions? will be fatal to much of the rest. But not, of course, in those rare instances in which it can be shown that the modifications made are made from their suitability to the material in which the ornament is constructed, and the nature of the thing ornamented. The drawing of design, indeed, except as a part of constructive work, contradicts its very name. But this argument will be clearer when the illustrative lesson has been given.

New York Vacation School for Boys.

Eighteen children were present, ranging from eight to fourteen years of age. Some were Grade III. children, some were Grade V., some Grade VI., and some Grade VII. We must remember this great diversity in the attainments of the pupils—a thing far more important, in my judgment, than the mere size of a class—when we criticise the lesson.

The teacher told me the children were about to "*do an art study.*" Oh! cannot we, as teachers, do something to check the use of pretentious terms of this sort, in which England is very little, if at all, behind America? They are rapidly making themselves at home in schools, and educated men of the world smile—a little contemptuously, I fear—at their grandiloquent unreality.

The teacher held a beautiful tiger-lily in her hand, and asked how the leaves grew. The question was a little vague *bien entendu*, and after a few answers had been given *à tort et à travers*, the teacher answered her question herself. "They grow in a bunch, we notice." But the children did not notice.

Some questions may have been asked previously about the flower, for the teacher now drew on the wall-slate a conventionalised rendering of the flower and leaves of the tiger-lily.

The teacher's drawing is reproduced below, very much reduced in size.

The children were drawing on white square papers with 6¼ inch sides, and surfaces which would take a wash of paint. They drew in outline from their teacher's drawing. There was no analysis, either by teacher or children, nor was there any inspection of the work done, to see whether the drawings were correctly proportioned. I incline to think the teacher's copy was not required to be copied except in general intent. Of course, to have the teacher's drawing on the board at all was a big departure from the theory of the exercise, which was *the elaboration by the child of conventional ornament from a natural form.* The conventional ornament derived from a tiger-lily being balanced, it was necessary only to draw one side. For, when all the children had finished one side, the teacher said, "Now dip your brushes in the water-dish; do not fill them too full; and rub over the blue paint twice. Then watch, and paint like this." The children did not appear to watch very closely, for certainly they used their brushes very differently from their teacher. But they got the colour on somehow.

"Now," said she, "fold your papers along the middle line." In order that they might know exactly what to do, she rapidly coloured a drawing of her own, and then folded the paper inwards along the middle line of the drawing. "You see," she said, "I have now got a picture transferred to the other side."

The pupils then folded their papers, and thus transferred the colour from one side of the middle line to the other; but it resulted in very little but smudgy, blurred shapes, which the teacher told the children to improve and to paint in more completely.

All these children, according to the teacher, were supposed to have had much teaching in drawing; so she was disappointed with the results. So was I, if they had really been taught either to observe what they were drawing, or to modify it on a conception of their own so as to be more beautiful in their own eyes. For truth compelled us both to confess that it was a most evilly-entreated tiger-lily: it was not even conventionalised; it was merely misrepresented.

Of course, one could not reasonably expect unpractised children to lay on a colour-wash so that it would transfer accurately and evenly—the failure to transfer the colour was only to be expected.

What, then, is the whole upshot of failures of this kind?—not, by the way, confined to American schools. It seems to me somewhat thus:—

Before children can be expected to produce conventionalised modifications of what they see, we should endeavour to be fairly sure that they can see and portray what they are actually looking at—a very difficult task in itself to all children and uninstructed persons—of much more difficulty than one section of present-day educationists is aware. Constructive design is out of the question until children can not only observe well and draw fairly, but can also make *imaginative modifications of what they see, so as to be suitable to the material and purpose of the ornament they are making.* It is not by muddling up fact and fancy—not by incapacity to observe accurately—that a child becomes imaginative as a draughtsman. On the contrary, rightly directed, perception and imagination can be cultivated together.

(*To be continued.*)

Craftsmen or Casuals.

"Be that hath a trade hath an estate."—*Old Guild Motto.*

BY "OBSERVER."

SIR STUART KNILL, the present Lord Mayor of London, is taking a special interest in the matter of apprenticeship; and wishes to see a return to the old system, under which the future craftsman learnt his trade and his morals from his employer, slept under the counter or the stairs, and eventually married his master's daughter. His lordship, therefore, had a congenial task when he was called upon not long ago to open, in the beautiful Drapers' Hall in Throgmorton Street, an exhibition of apprentice work done by the learners in various trades within the metropolitan area.

At the request of the Editor, whose enthusiasm on this subject is as keen as I hope it will prove infectious, I walked down into the City on a Saturday afternoon near the end of February, and stood for a few moments on the steps of the Drapers' Hall watching the operations of those Stock Exchange members who do business "on the street," and learning what is meant by "bulls and bears." Then I passed within the quiet portals of one of the most beautiful guild halls in the world, obtaining, as I mounted the stairs, a peep into an old-world garden which is one of the sights of the City of London.

The exhibits were conveniently arranged under the various trades, and were plainly marked with names, ages, and other particulars of the apprentices who had "wrought" them. The trades represented covered a wide range—including needlework, jewellery manufacture, designing, printing, building, furnishing, coach and barge building, engineering, instrument making, leather manufacture, and other minor occupations.

The show was organised by the Apprenticeship and Skilled Employment Association, which has its headquarters at 36 and 37 Denison House, Vauxhall Bridge Road, London, S.W., and has seventeen affiliated committees in London, as well as corresponding committees

OPENING OF THE APPRENTICES' EXHIBITION IN THE DRAPERS' HALL BY THE LORD MAYOR AND LADY MAYORESS OF LONDON.
(Copyright, Illustrations Bureau.)

at Liverpool, Hastings, Oxford, Cambridge, Glasgow, Edinburgh, Kingston-on-Thames, Enfield, Camberley (Surrey), Birmingham, and Croydon. The methods of work adopted by the Association are as follows :—

1. Applications of boys and girls for skilled work are received at the offices of the Local Committees. (*N.B.*—Many of the applicants are sent direct from the schools on the recommendation of the Children's Care Committees, or the head teachers.)

2. One or both parents of the applicant are seen and consulted before further steps are taken.

3. School teachers and members of the Children's Care Committees are consulted as to the character and special aptitude of the applicant.

4. If a suitable opening is not known, employers are visited by the local secretary or other representative, for the purpose of placing the boy or girl. Full inquiries are made as to terms, prospects, and methods of teaching, and all information acquired is registered.

5. After a month's trial all the parties are seen again. In the case of apprenticeship, indentures are drawn up, the local committee being a fourth party; and where necessary and considered reasonable, premiums are advanced out of the funds of the Committee or other sources, in nearly all cases by way of loan, without interest.

6. When a boy or girl is satisfactorily placed as an apprentice or learner, arrangements are made for attendance at technical or other classes, where possible during working hours.

The work at this London exhibition had been executed by apprentices who have been "placed" in life by the excellent body of practical people who *work* while more or less prominent people talk. My own general impression was one of wonder that such exhibits could come from the 'prentice hand. I myself, of course, being an unskilled labourer, could not see many signs of the callow craftsman; but there were certain young people distributed about the hall (the ceiling is a dream of sensuous beauty, very unlike a draper's vision) who were very keen critics indeed. Judging from the remarks of these young visitors, there were imperfections here and there; but their criticisms only showed their keenness.

It was good to see this keenness, which was almost as great as the enthusiasm of the ordinary City clerk for "Our Miss Gibbs." It reminded one of the days when work was a "craft," and the delight in workmanship took the strange form of finishing off with loving care even the pieces which were to occupy the dark corners! If these boys and girls keep this fine enthusiasm, they will in after years only be dull and lonely when they are in so-called "jolly" company. I thought, as I walked round the stalls, of the Japanese craftsman who, on being told that a piece of his work just finished was as beautiful as the hand of man could make it, replied with a shake of the head, "Nay, but the next will be still more beautiful." There is the spirit of the true worker, which makes even drudgery divine.

But I must conclude on a practical note, for the eye of the Editor is upon me. If any of my readers want to know more on this subject, let them buy any or all of the following publications (to be obtained at the Central Office of the Apprenticeship and Skilled Employment Association) :—

Trades for London Boys. Price 9d.; postage 2½d.—
Trades for London Girls. Price 9d.; postage 2½d.—

The Work of an Apprenticeship Committee. By M. K. Bradby. Price 1d.; post free, 1½d.—*Suggestions for Committees Newly Starting.* Price 1d.; post free, 1½d.—*The Hampstead Apprenticeship and Skilled Employment Committee: Aims and Methods.* Price 1d.; post free, 1½d.—*Industrial Prospects for Boys and Girls.* By H. W. Jevons. Price 1d.; post free, 1½d.—*Specimen Indenture Forms.* Price 1d. and 2d.—*Boy and Girl Labour.* By N. Adler and R. H. Tawney. Price 1d.; post free, 1½d.—*Apprenticeship Law.* By E. A. Myer. Practical Handbook for the use of Apprenticeship Committees and others. 2s. 6d. (In the press.)

A NEW COURSE OF PRACTICAL AND CONSTRUCTIVE WORK,

ARISING OUT OF AND COMBINED WITH THE ORDINARY SCHOOL SUBJECTS.

For Junior, Middle, and Upper Divisions of Primary Schools.

BY A. R. PICKLES, M.A., AND DALTON GRANGE.

Notes and Answers to Correspondents.

G. P.—Yes; the course is given in greater detail than appears necessary at first sight. But the object is to enable teachers who have not yet attempted such work to cope successfully with it from the first, and especially to enable head teachers to place the course in the hands of the younger and less experienced class teachers as a full and complete guide to subject matter and method of treatment.

E. W. P.—No; you need not ask children to write down all which is noted in these pages. It is not an essential part of the scheme. But in some way—by word, number, or sentence—the results of the child's observation and investigation need recording in the book. By all means diminish as you please the amount of written matter, so long as the essentials remain. We are glad you think the course so very practical and useful.

A. J.—The reproduction of copies, such as those in Lesson 3 (February number), is quite easy by cyclostyle or jelly. You can either reproduce on plain paper, and let the children paste the copy in their book, or reproduce (from jelly) direct into the child's book. The latter is very little trouble, and saves time, if you prefer it.

T. M.—See the introduction (February number).

J. H. B.—Yes; it would undoubtedly be an advantage if the drawings and designs were reproduced in colour. But this would be very costly, and after all it is easy to see from the black-and-white what is intended.

Lesson 9.—The Plumb Line and The Spirit Level—Kinds of Lines.

Note.—For this lesson the teacher will require a mason's plumb line, a spirit level, and a few bricks.

1. Hold the plumb line in a vertical position in front of the class. Let pupils feel at the string and its weight. Perhaps some pupil may be able to tell what the weight at the end of the string is made of. Probably the father of one of the pupils is a mason, and this pupil no doubt will be proud to tell his fellow-pupils that the apparatus is called a plumb line. Why plumb line? Explain plumb.

2. Arrange the bricks one above the other so that the edges are not vertical. Place the plumb line against the edge of the bricks after the manner of the mason. What do you notice about the lead? About the string? Can any one arrange the bricks so that the lead shall be in its proper place? Apply the plumb line again. When does the lead hang correctly? Now apply the plumb line to another side of the bricks. Are the bricks here straight up or not? How do you know? (Let a pupil build them straight.) Now take the plumb line and see if they are right. Who has to see that bricks are upright? Who uses the plumb line? For what purpose? Why should the bricks be straight up?

3. At home make a plumb line, without the wood part. Some exercises with the pupil's plumb line.

(*a*) How many inches long is your string?

(*b*) Place your rubber exactly under the edge of the desk.

(*c*) Tilt the swing blackboard. Put this halfpenny exactly beneath the bottom right-hand corner of the board.

(*d*) Slightly move the blackboard and repeat.

(*e*) Now do it with the mason's plumb line. Which is the better? Why? Which is the quicker one to use? What have you to wait for when using your own plumb line? (swinging).

(*f*) Ask one pupil to place some object—that is, swing blackboard, etc.—in an upright position, without using the plumb line. Allow another pupil to test.

(*g*) Allow the class to test various upright surfaces, such as the surfaces of the wall, the door, the sides of the teacher's desk, the cupboards, etc.

(*h*) Give the name vertical.

4. Introduce the spirit level. Place on a writing-pad, and ask several of the pupils to hold. They will probably think the movement of the little bubble of air inside very funny, and the experiment will provoke curiosity and arouse thought.

5. Place on a perfectly level surface, and allow class to note the position of the bubble. (Have this surface tested beforehand, or it may be some time before one is found.)

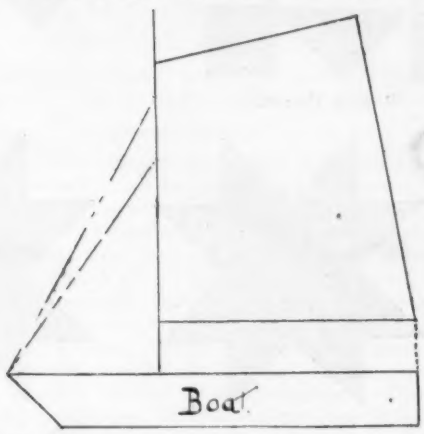
Allow various members of the class to test with the spirit level several level or supposed level surfaces—for example, the top of the desk, the floor, window-sill, any ledges, the top of the teacher's desk, the seats, etc. Now hold your pencil in an upright position. If you put it flat on the desk, or on the floor, what position would it be in? When is a boy in an upright position? When in a level position? Tell me something whose top is always level. (Water, liquids generally.) Give the name horizontal. Ask the class to place pencils in a horizontal position. In a vertical position. In a position which is neither horizontal nor vertical. In what position is this? (slanting.) Show me any slanting lines in the room. Give the names oblique, slanting, sloping.

Some Questions.

N.B.—Graph a sufficient number of copies of the boat to give each child one.

1. Which end of the boat is a sloping line?
2. How many other sloping lines can you count?
3. Which is the shortest vertical line?
4. What does the other vertical line represent?
5. What kind of lines do the ropes form?

How the Pupil's Page could be Arranged.



1. The left-hand end.
2. Four.
3. Right-hand end of the boat or the shortest rope.
4. The mast.
5. Sloping lines.

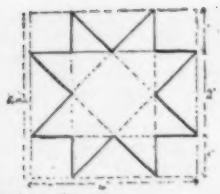
N.B.—This might also be used as an exercise in measurements.

Lesson 10.—Exercise on the Square—First Exercise in Original Constructive Work.

Draw, as shown in the diagram, on coloured paper. Cut out along the thick lines. Fix the large piece in the book, arranging the smaller pieces to form designs similar to those shown in the black illustrations.

Some Questions.

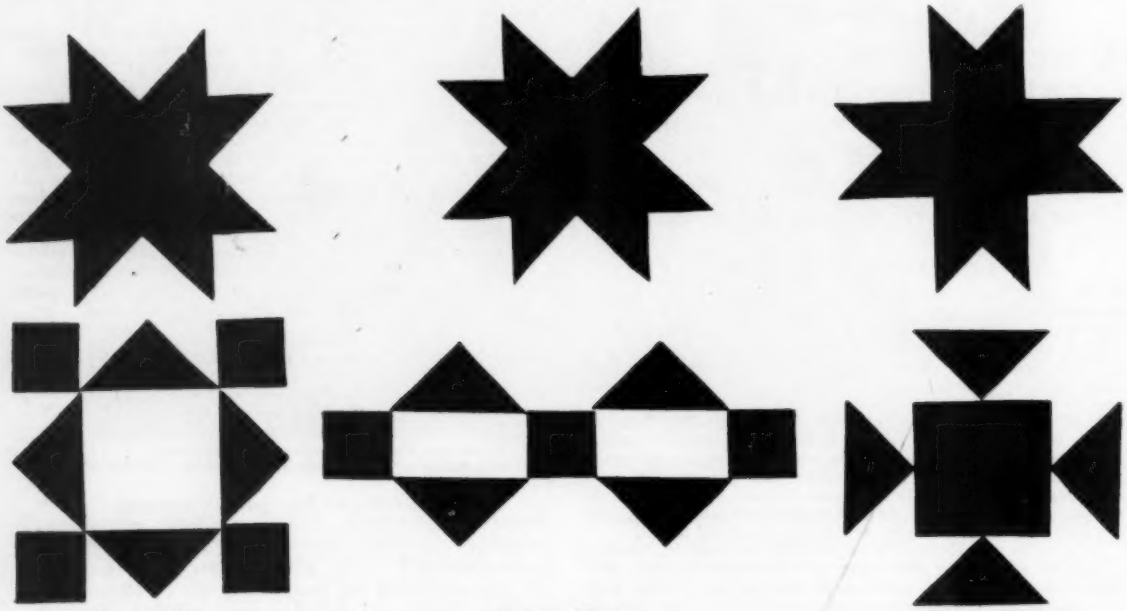
1. How many horizontal edges has this larger piece?
2. How many vertical edges?



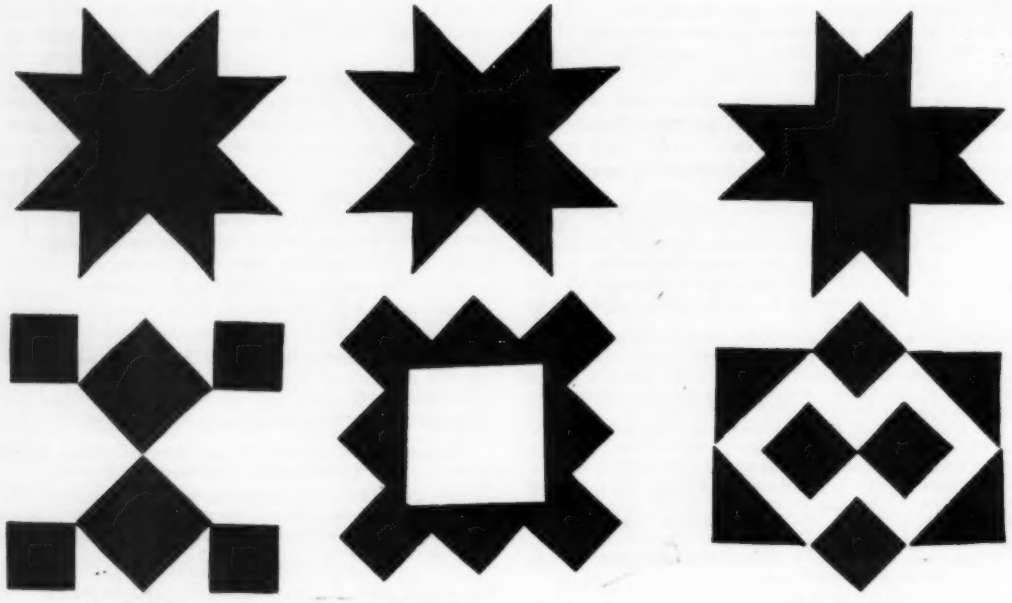
3. How many sloping edges ?
4. What is the total number of edges ?
5. What is the total length of all the vertical edges ?
6. Of the vertical and the horizontal edges ?
7. What is the difference between this answer and the perimeter of the square from which it was cut ?
8. What is the perimeter of the four squares cut out ?
9. What is the length of the longest edge of one of the three-cornered pieces ?
10. What would be the perimeter of a square formed by the longest edge of these four squares ?

N.B.—The children should be permitted to make their own design with the eight small cut-out pieces without help or special direction of any kind. This is really the first exercise in *original constructive work*, and it will be found that many pupils will get really good designs. The illustrations below are actual copies of designs made by some boys in a class which is now working through the course. No help was given, and there was great variety in the designs.

LESSON 10.



ROBERT HORNE. ARTHUR HOLDEN. ERNEST MILLER.



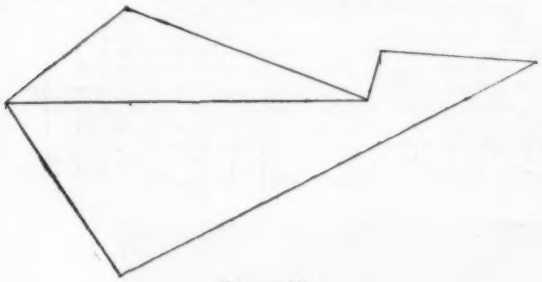
SAM WHALLEY. JOHN JAMES CROSS. CHARLES BRIGGS.

SUPPLEMENTARY LESSONS FOR PRACTICE AND FOR INTENSIVE TEACHING.

The first ten lessons constitute one-half of the Junior Course, and from these the pupil may pass without loss of any essential part of the theory or principles to Lesson 21. But it will be found possible and desirable in many cases to take additional work for practice and for intensive teaching. Short heads of Lessons 11 to 20 are now given for this purpose, but the lessons themselves are not elaborated. It is probable that the whole course will be published in book form, and the lessons here briefly indicated will be there set out fully.

Supplementary Lessons.

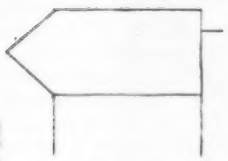
LESSON 11.—Measurement of lines; half-inches; on lines of Lesson 3. One copy to be supplied to each pupil.



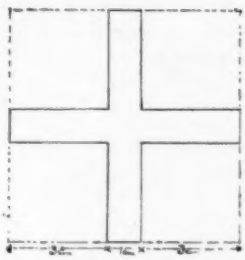
LESSON 11.

LESSON 12.—The peg; measurement of lines; half-inch; one copy to be supplied to each pupil; measurements and calculations.

LESSON 13.—Draw and cut out of coloured paper; arrange the four squares to form a design; then give questions as in previous lessons.



LESSON 12.



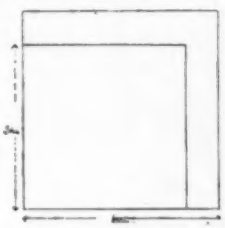
LESSON 13.

LESSON 14.—Draw a square of $3\frac{1}{2}$" side. Draw the diagonals. It will be found possible to set a good many questions on the sum, difference of diagonals, sloping lines, etc.

LESSON 15.—Draw and tint, then cut out. Arrange the four green squares to form a design. Place the two yellow pieces together to form a square, etc. Arrange questions on perimeters, sides, etc.

LESSON 16.—Draw two squares as shown on coloured paper. Fix the two squares as in the diagram. Questions on perimeters, etc.

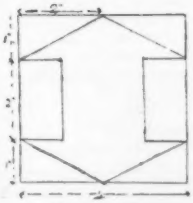
LESSON 15.



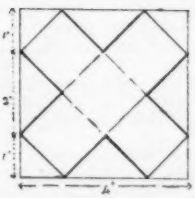
LESSON 16.

LESSON 17.—Draw on coloured paper. Cut out and arrange small pieces to form design. Questions on lengths of lines, etc.

LESSON 18.—Draw on coloured paper. Allow pupils to form original designs, as in Lesson 10. Questions as in previous lessons.

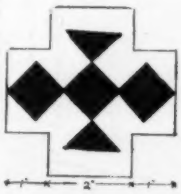


LESSON 17.

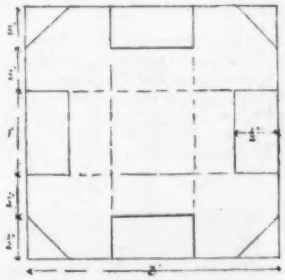


LESSON 18.

LESSON 19.—Give alternate boys the same colour of paper. Allow boys to exchange corners; then fix as shown. Questions as in previous lessons.



LESSON 19.



LESSON 20.

LESSON 20.—Draw and cut out of coloured paper. Arrange separate pieces to form design. Questions as in previous lessons.

THE CONSTRUCTIVE MOVEMENT IN CANADA.

ONTARIO'S PROGRESS IN ELEMENTARY TECHNICAL EDUCATION.

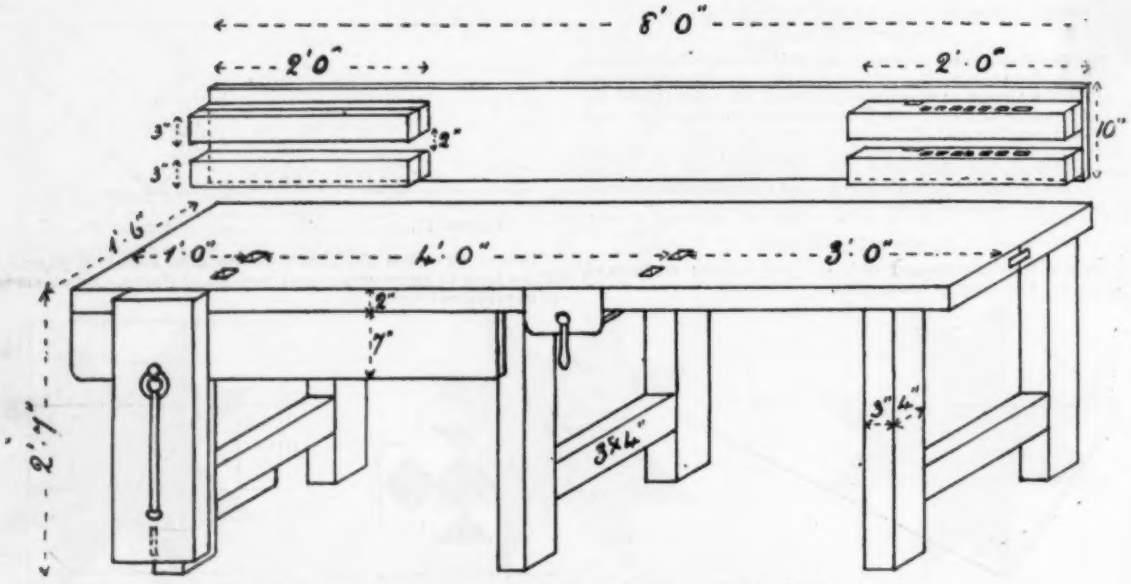
BY ALBERT H. LEAKE, INSPECTOR OF TECHNICAL EDUCATION, TORONTO.

(*Continued from page 501.*)

WE felt that, with an expert and enthusiastic body of teachers to act as missionaries, a great step had been taken; but there remained something yet to do—to get the various Educational Authorities interested, and to actually introduce the subject into the schools. To bring this about, a thirty-two page pamphlet, printed on coated paper and with twenty-three illustrations, was prepared, and copies sent to the public and separate School Board of every village and town throughout the province. Every member of the local Legislature also received a copy. The pamphlet contains the Departmental regulations, and hints and suggestions for carrying on the work in various materials. The different Educational Authorities have been left as free as possible, as the following regulations will show:—

1. The public or separate School Board of Trustees in a village or a town, that provides and maintains a department for teaching the elementary industrial arts, employs a teacher with a Departmental Certificate in these subjects, and provides accommodations and equipment satisfactory to the Minister of Education, shall be paid by the Minister an initial grant not exceeding $50, and a subsequent annual grant of $30, for each school approved by the Minister, from any appropriation made by the Legislature for instruction in these subjects.

2. These provisions shall not apply to any School Board receiving grants for manual training. Manual training can be satisfactorily carried out only where preparatory training is given in the elementary industrial arts, and the grants



BENCH, FIXED TO THE WALL OF CLASSROOM, FOR TWO PUPILS.

This may be taken as representing two units, which may be increased indefinitely, according to the space available.

made for manual training under Regulation 150 of 1904 cover both elementary industrial arts and manual training.

3. The School Board shall provide the necessary tools, materials, and other requisites, with facilities for storing the same when not in use, and suitable classroom accommodation for carrying on the instruction.

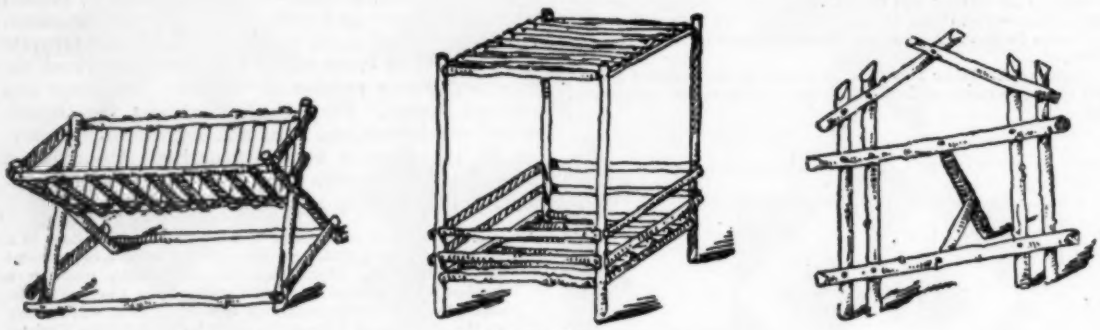
4. The accounts of the course in elementary industrial arts shall be kept separate from the general school expenditure, and the grants made must be expended solely for this course.

5. Much of the work of the course in elementary industrial arts may be done out of school hours, but a definite place must be provided for it in the time-table, satisfactory to the Inspector of Technical Education.

6. On the report of the Inspector of Technical Education that the organisation and the teaching are satisfactory, an annual grant of $30, in addition to the regular salary paid by the School Board, will be paid by the Minister out of any appropriation made by the Legislature for this purpose, to each legally qualified teacher who holds a certificate in elementary industrial arts, and who gives instruction in accordance with the regulations of the Department of Education.

suitable for school libraries is also given. It has long been the fashion to contend that the benefits to be derived from handwork in schools are wholly educational—whatever that may mean—and manual-training teachers stood on their dignity and maintained that their subject was never intended to help other school subjects, and, above all, did not have, and could not have, any direct industrial value; but on this side of the world, at any rate, a change has come about. It is being recognised that the subject must be correlated to other school subjects, and that, more important still, to achieve its full results it must confer some industrial outlook on the child, that without directly training carpenters, metal-workers, bookbinders, or bricklayers, yet it should give the boy that type of mind which will prejudice him in favour of an industrial occupation and give him that knowledge and skill applicable to all.

Suitable forms of work are to be taken in every grade,



TWIG WORK.

Information is given under the following heads: Organisation, Accommodation and Equipment, Drawing, Paper and Cardboard Work, Clay Modelling, Knife Work in Thin Wood, Elementary Metal Work, and Bench Work in Wood. A useful list of reference books

that in the lower being carefully planned so as to make adequate preparation for the next higher; and it is recommended that one take the subject in each school, and move from class to class, in order that the final purpose of the work may be best achieved. As the

work is intended to have special reference to the industries of the district, specimens of the articles manufactured, both complete and in process, are to be collected, thus forming the nucleus of a live museum. Employers and manufacturers are to be invited to give periodical talks to the pupils on the particular trades in which they are engaged, the articles they manufacture, the processes they undergo, the materials from which they are made, and the countries from which they are obtained. This information will be afterwards used for exercises in composition. A feature is also to be made of visits to shops, factories, buildings in course of erection, etc., under proper guidance.

In the primary grades no addition to the furniture of the ordinary classroom is really necessary, though a large flat-topped table will always be found to be of great service. Where space will not allow of such provision, two boards nine or ten inches wide, and jointed together in the form of a table-top, may be placed across the tops of the desks. This may be the length of two desks and the aisle between them. When not in use, the top may be placed alongside the wall.

For the necessary tools, a small box or tray should be provided, having a special place for the scissors, knives, pencils, erasers, rulers, paste, etc., to contain the whole equipment needed for one class. This box can be easily carried from one room to another.

Where industrial work is done, as it will be in the majority of cases, at the ordinary school desk, it is advisable to provide a sheet of stout millboard in order to protect the top. Another convenient method is to provide a tray.

As this course is intended for those schools unable to provide a properly-equipped manual-training room, some provision has to be made for providing bench accommodation in the ordinary classroom. A long, narrow bench fitted to the wall will best serve the purpose here. In the pamphlet referred to, a working drawing is given (see page 574), so that such a bench may be built by the local carpenter at small cost:—

The following is the equipment for the course:—

Paper Work.—Pencil; scissors; ruler graduated in inches, halves, quarters, and eighths; millboard for each pupil to protect the desk top; paste or other adhesive; and paper for drawing and construction.

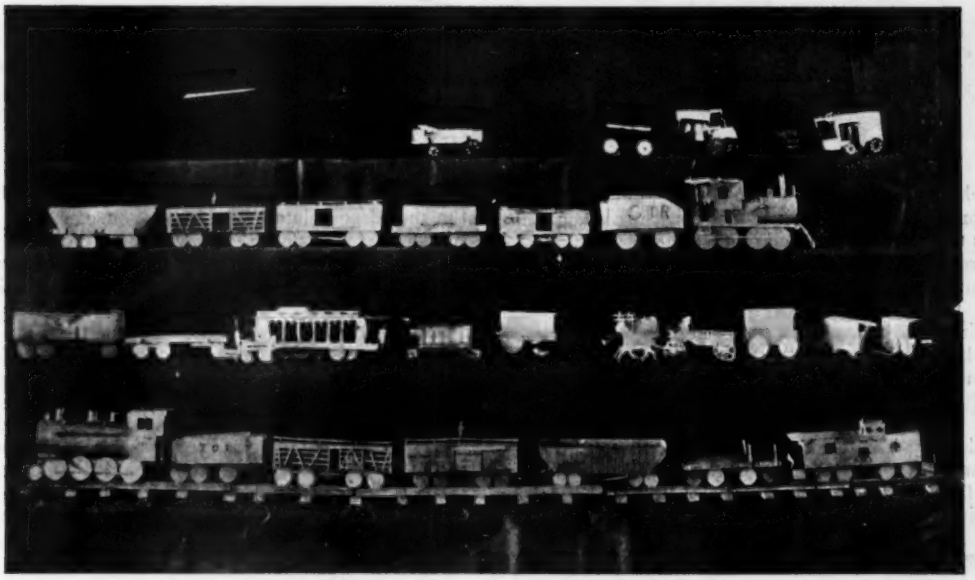
Cardboard Work.—In addition, knife, compasses, set-square for each pupil, one ticket-punch for every five pupils, and cardboard of various weights.

Knife Work.—Knife, pencil, ruler, compasses, try-square for each pupil, three or four small hammers, two hand-screws, oil-stone, oil-can, and assorted bradawls for the class, and working material.

Elementary Metal Work.—Flat pliers, round-nosed pliers, rule and pencil for each pupil, snips for every four pupils, two or three small hand-vices, small hammers, punch and paint-brush for general use.

Bench Work.—For bench work in wood there should be provided for each bench or bench place one each of the following tools: Bench hook, drawing kit, pair compasses, rule 2 feet, marking gauge, try-square, jack plane, firmer chisel 1 inch, firmer chisel ½ inch, firmer chisel ¼ inch, tenon saw, bench whisk.

The following general tools: Smoothing plane, try-square 12 inches, two screw-drivers, two braces with assorted bits, metal and wood countersinks, one jointer plane, two gimlets, two bradawls, one bevel, one mortise gauge, two nail sets, one wood handscrew, one pair pincers, one pair wing dividers, one pair cutting pliers, four hammers, one hatchet, one pad saw, one rip saw, one cross-cut saw, one grindstone.



Cardboard and Paper—Transportation Studies.

In addition to the above general equipment every schoo should have a large tee-square, two set-squares of 45° and 60°, a graduated rule, and a pair of compasses, for blackboard use.

It would take too much space to give the details of the course in each grade and subject. The instructions given by the Department are suggestive only. The Minister leaves each district as free as is consistent with efficiency to develop its own courses in conformity with the local industries. It is confidently hoped that, by the methods briefly outlined above, every town and village school will, during the course of the next two or three years, have as an integral part of its course of instruction such work as will give a definite industrial outlook, predispose the pupils to the practice of some productive industry, and establish a solid foundation on which to build more advanced technical instruction.

A New Art for Children.

FOR some little time it has been realised that children do not see things in outline or detail, but in the mass or solid form.

Give a child the task of making an outline drawing of an animal, or even an inanimate object, and the result will be either something quite unrecognisable or an extraordinary caricature of the original. But give the same child some clay or some plasticine, and it will very often produce a quite realistic model with apparent ease.

FIG. 1.

It is this growing appreciation on the part of teachers, and grown-ups generally, of the manner in which the child-mind works, that has led the more thoughtful ones during the last few years to provide the child with modelling clay instead of a pencil and paper.

At the Exhibition of "Art in the Life of the Child," held in Moscow shortly before Christmas, Mr. S. K. Isakoff was able to introduce to educationists a new art of extraordinary interest which he has invented for children. This art is the modelling of men, horses, dogs, and other animated objects in twisted paper.

On first consideration this does not seem a very promising material; but, as the illustrations to this article will show, astonishingly good results can be obtained by this means with comparative ease.

FIG. 2.

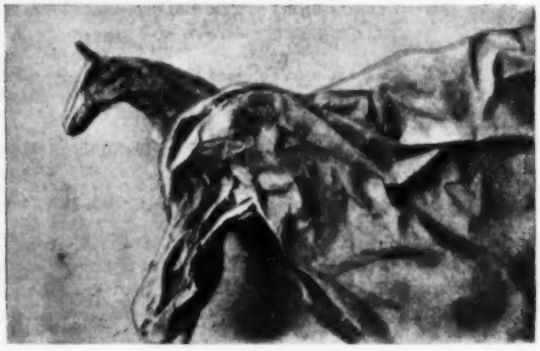


FIG. 3.

In an explanatory pamphlet, Mr. Isakoff says that the statement that a child can model easier than it can draw requires qualification. Theoretically this is correct, but in practice this opinion is not fully justified, because, as soon as the child turns from inanimate objects to living things, unexpected difficulties inherent in the substances employed present themselves. Even plasticine requires a certain amount of finish, and as soon as a child comes to put in detail it is almost sure to go wrong.

Twisted paper has the great advantage that you need only give the essentials of the object in order to make the model complete. Moreover, you can only make a simple model in paper, however much you try to elaborate it. Such work is not only truly artistic, and gives great delight to the child, but the imaginative and creative faculties are brought into the fullest operation whilst the child is amusing itself.

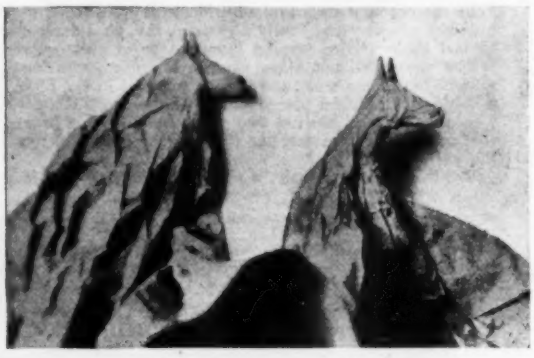


FIG. 4.

FIG. 5.

Mr. Isakoff had no toys to amuse himself with as a child, and he and his brother made paper figures to amuse themselves; and from these crude attempts Mr. Isakoff has gradually improved the art, until it was possible to produce the really wonderful groups of paper figures shown at the above-named Exhibition.

In studying drawings by children, it can be seen that their object is to transfer to the paper character and movement rather than details. Where a characteristic detail does attract their attention, children usually exaggerate it out of proportion to the rest, very much in the same manner as a caricaturist

FIG. 6.

Twisted paper suits their purpose admirably. Take the horse (Fig. 10), for example. What can be simpler than this horse, with its legs as straight as sticks? With a little practice a child can make this in three or four minutes. Then by bending its legs you get a wonderful sense of movement without the least difficulty; and again, by bending its neck and head, and

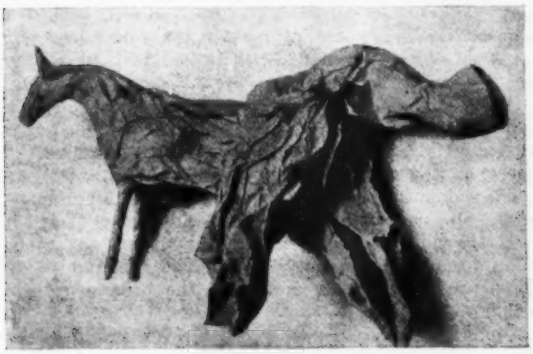


Fig. 8.

altering the position of its legs, it is now only fit for cat's meat (Fig. 12). Put the horse into a sledge, make a little paper man and place him in it, and here you have the driver hurrying on the poor beast.

The method of producing the figures is quite simple; and as all vertebrated animals are made on the same principle, the explanation of the making of one figure will serve for all. When you are making another animal, it is only a question of altering the proportions. In making a horse, for example, which may be regarded as a typical animal, Mr. Isakoff's method is to take a rectangular piece of paper, with the sides in the proportion of about 2 to 3, to commence with. Turn down one corner, as shown in Fig. 1, and crumple it slightly, in order to make the paper more pliable. The size of the corner which is turned down may be varied according to the animal which is being reproduced. For example, to make a camel or a giraffe, or other animal with a long thin neck, a small corner of the paper must be turned, whereas much more paper is

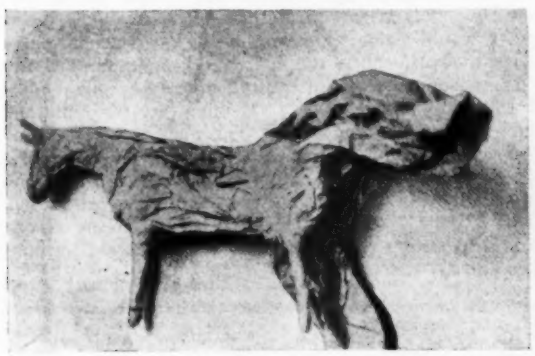


Fig. 9.

needed to form the neck and chest of a pug dog or a buffalo.

Then begins the twisting proper. It is done in this way. Out of the middle part of the turned-down paper the head of the animal is shaped. It must be crumpled and made sufficiently compact, outlining the wider and upper part of it for the skull, and the lower part of it for the muzzle (Fig. 2). You must bear in mind that at first the shape is only outlined roughly, and full scope is left for changes being made during the twisting of the figure.

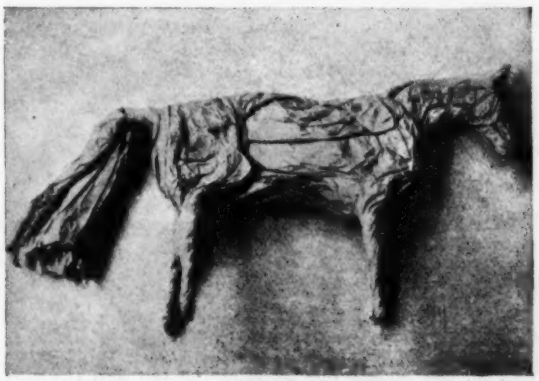


Fig. 10.

The finishing touches take place after the rough model is made. When the head has been prepared, the ear and cheeks are attended to at the same time. For this purpose the paper is pulled out from within and brought up close to the head on each side, as shown in Fig. 3, and the upper portions on each side are twisted, as shown in Fig. 4.

Twisting must always be done in one direction—namely, towards yourself, and as strongly as possible, otherwise the figures will easily become untwisted. After this the neck must be made. You need not give much time to making the neck; it is only necessary to measure its length, and the finishing touches can be put in after the rough sketch of the whole figure has been made.

It is very important to learn how to make the front part of the animal's body. If the paper for the fore limbs is twisted straight from the neck, it will appear

Fig. 12.

as if the front legs grow from the neck or the stomach. Just as the cheek and ear were manipulated at the same time, so must the shoulder and fore legs be made together.

To accomplish this, the paper is pulled out close to the neck on both sides (Fig. 6) and folded; the upper

part makes the shoulder, and from the lower part the leg is twisted. After having finished the front part of the animal, the body proper is pressed into shape, and its outlines made.

Fig. 13. Fig. 14.

The rest of the paper is divided into three parts (Fig. 8), the middle one forming the tail and the side portions the hind legs. Care must be taken here that the legs do not appear to grow out of the body, but form a continuation of the hind quarters.

In this case also the paper must be pulled out at the sides and at the back, and then placed in a fold, the upper part of which will form the haunches and the lower part the legs of the animal. After this it only remains to slightly twist the tail just where it is attached to the body, and the rough outline of the whole animal is ready (Fig. 10).

The difficulties that are likely to be encountered are almost obvious. The principal ones are, first, to select a piece of paper of the right size for the animal it is intended to form; and secondly, to judge correctly what size the corner should be which you commence with. With a little practice these difficulties are soon overcome.

It is not necessary to try to make the figures round. In the first place, to secure such a shape is impossible with many animals—such as a horse, for instance. Besides, the majority of the figures always turn out somewhat flat, rather like bas-reliefs. The artistic value of the figures is not by any means lessened on account of it.

Fig. 15. Fig. 16.

The work of twisting the figure of the rider is very much simpler than that for the horse. The small turned-down corner of the paper is shaped into a firm, round head, and the neck is formed by giving it a double twist (Fig. 13). The arms are made together with the shoulders, on exactly the same principle as with the horse. The paper must be folded near the neck, the thicker part forming the shoulder, and the end being twisted into the shape of a hand (Fig. 13). The legs are made in a similar manner (Fig. 14).

The coat can be made by taking a rectangular piece of paper of suitable size (Fig. 15), folding it in two, and making a double hole in it. This forms a sleeveless coat. The upper part, when turned down, makes a more or less wide collar, which can be adjusted to suit the style of the garment. Other modifications of the idea will readily suggest themselves.

If the hand be slightly torn, a lance or a sword or a whip, as in the figure, can be fitted into it and the paper twisted to hold it. Then you have the warrior or the driver, or whatever your fancy dictates.

The saddle is made by starting again with a rectangular piece of paper and twisting one saddle bow (Fig. 17) from the middle of one of its longer sides, the other being formed in a similar way. The remaining side pieces are rolled inside and form the prominent side cushions.

Any kind of rag paper is suitable for twisting the figures. Brown wrapping paper is very good. The

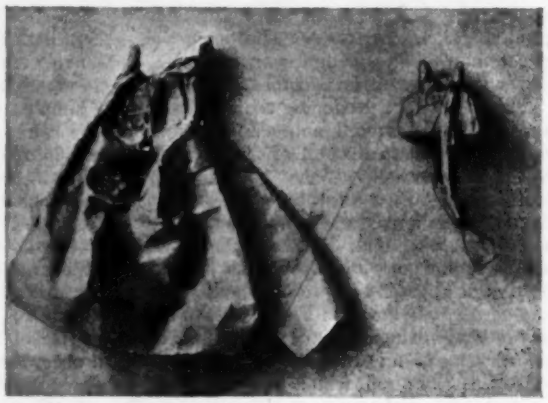


Fig. 17. Fig. 18.

small figures are best twisted from cigarette paper. Very varied effects can be obtained by the use of coloured paper, and the effects can be heightened by the use of water-colour; but this must be used sparingly, as the moisture causes the figures to become untwisted.

The accompanying illustrations give an excellent idea of the wide possibilities of this new art for children, and perhaps grown-ups too. The materials cost practically nothing, and the making of these paper figures, which are wonderfully expressive of life and motion, serves admirably to cultivate powers of observation and imagination. I certainly think it should receive most careful attention on the part of our education authorities and art schools.

N.B.—Further illustrations of finished models will be given next month. Meanwhile some of our readers may be sufficiently interested to make experiments in this new medium.

A PRIZE OF TEN SHILLINGS

is offered by the Editor for the best photograph of a model made by any of his readers.

FAR AND NEAR.

INTERESTING ITEMS FROM VARIOUS SOURCES.

The Neglected Hand.

SPINNING and weaving are almost gone. The knitting of the Scottish peasant women, the embroidery that was the pride of king's daughters, are well-nigh forgotten. Needle-making and pin-making have quite disappeared. Carpentry is invaded in every department by the machine. Papermaking, bookbinding, engraving, all tell the same tale. The culture of the hands is called for less and less. It may not be so always. In many directions to-day efforts are being made to save or to revive the handicrafts for their own sake and the sake of society, which loses so much of beauty and elasticity through the triumph of the machine. But at present the machine dominates us. The man of to-day could not make the flint implements of the Neolithic age.—*Daily News.*

* * *

No Grit, no Eggs.

IT is absolutely necessary, especially in confined runs, to supply hens with very hard grit and oyster shells. Flint grit is now sold in small bags, but old bottles or broken crockery smashed up into bits about the size of a wheat grain will answer the purpose very well. Even when poultry are allowed liberty of run, the small sharp stones of a suitable size which they search for and swallow will in time be used up, and then, unless sharp grit is supplied, the birds will suffer in health and power of laying.

What purpose in a bird's physical economy the swallowing of this hard grit or sharp stones serves is not yet decided. All that can be suggested, in our present state of knowledge, is that somehow the grit helps the bird to digest its food.

Place the grit in little open boxes nailed to the side of the house, and let the boxes be only just sufficiently large to allow the birds to pick out the pieces of grit they require without spilling any.

One expert says that the supply of grit has more to do with the health of the birds than the size of the run. —*H. B. Buchanan in "The Country Home."*

* * *

The Tontine of Fame.

IN the eighteenth century, and even in the earlier years of the nineteenth, the tontine was a favourite form of speculation. A certain number of men made equal contributions of money, which was used to erect a building, or otherwise invested; and the investment became the sole property of that one of the original subscribers who happened to survive the longest. Although the tontine has now fallen into innocuous desuetude, it was alluring in its way, and it was specially tempting to strong men with superb confidence in their own vitality. Indeed, its attractiveness is exactly the reverse of that of life insurance, in which, as the California gambler put it, "you have to die to beat the bank."

Although the tontine no longer appeals to the speculative as a method of getting a good deal for very little, it can be discovered still in existence in other realms of human activity than the financial. In politics, in literature, and in art some of the men who manage to survive beyond the allotted threescore years and ten profit unduly by the mere fact of their longevity. They gain an excessive reward in reputation by survivorship. The aged politician who has retired from active service, lingers in the public gaze in the lofty position of a sage; and he bulks bigger in the eyes of his younger contemporaries simply because he still exists in the flesh. For example, we may query whether Gladstone, who attained to fourscore, was really a wiser and a more farseeing statesman than Canning, whose career was cut short at less than threescore. In other words, Gladstone lived long enough to profit by what we may call the tontine of fame.—*Scribner's Magazine.*

* * *

The New Age.

"INDUSTRIAL remedies must not be curative only of existing evils; they must be preventive also, and prepared to meet new evils as they arise. . . . If only we could apply effective remedial action to the young, in a generation the evil conditions which seem so unchangeable would be swept away. . . . The most valuable external influences, however, are not those which control the individual, but those which enable him to act more freely and more intelligently for himself."

"*It is, indeed, not this or that particular remedy that is the most essential need, but rather a vital movement; not laws or regulations, but the creation of a quiet determination on the part of men and women, rich and poor alike, to do their individual share.*"—*Charles Booth on the Burning Topic.*

* * *

The Bard Again.

THE study of Shakespeare may be begun at the age of twelve, if, by that time, a class has gained the necessary degree of proficiency in interpreting and reproducing narrative. If much help from the teacher is required, this in itself is sufficient proof that the children would gain more advantage by beginning Shakespeare later. It is unwise to plunge children into the difficulties of dramatic poetry without a preliminary talk on the differences between the narrative and dramatic form. The play will become a more real and intimate possession of the children, if, when the reading is finished, they spend one or two lessons in discussing points of interest that arise from it. Thus the teacher may require certain children in turn to say why they like Brutus, why Pistol is amusing, why Shylock is both admirable and detestable. It is important that the teacher should do little more than propose the subject and direct the discussion, leaving the actual matter to be provided by the children themselves. This practice of discussion helps them to appreciate the great qualities of the work, and should be applied to most of the books read.—*From the English Association's Latest Bulletin.*

* * *

The Preparation for Engineering.

AN ideal school preparation in the later years would be one which included mathematics and elementary chemistry and physics; but these should be balanced by a study of literature and history, preferably ancient as well as modern, so as to ensure as far as possible a broadly educated mind capable of looking all round a question before coming to a decision, such as is sometimes denied to the mathematical or physical specialist.

There has been such a sweeping change in the school methods of teaching mathematics in recent years that

it is less necessary than it was to emphasise the fact that an engineer wants his mathematics as a servant, and not as a master. He should, therefore, learn mathematics as a plan or model, which shows him how to get by the most direct route to the point he is aiming at, and not as an artistic piece of workmanship to be admired for its own sake. Curve plotting and other graphic and concrete illustrations of mathematical processes have done much to improve the modern teaching of mathematics from this point of view.—*Professor Capper.*

PERSONALLY, I should be inclined to regard this imperative necessity for a thorough overhauling of the house and its belongings as something at which to rejoice heartily. Without it we should grow sluggish and careless in habit, just as without that spell of spring sickness that is so common the organs of our body would tend to grow sluggish in action. We are compelled to make changes in diet and to partake of some of Nature's spring medicines, and so to accomplish something in the nature of an internal spring cleaning as well as an external one. It is well to bear in mind that spring disorders of a physical kind are danger signals which we disregard at our peril. Not without wise reason did the old Fathers of the Church lay down laws for Lenten faring. Underneath the strict regimen they prescribed lay a recognition of the fundamental laws of health, and when they banished from the dietary of devout souls all meats and rich foods, and urged the use of spring salad herbs, of eggs, and fresh fish, they had in view not only the elevation of the mind, but the relief of the digestive system and purification of the whole organism! —*Lucy H. Yates, in "The Country Home."*

Spring Cleaning.

WOULD you like to read the oldest love-letter in the world? It dates from three thousand years ago—that is, before Athens was of any importance, or Rome; about the time when David and Solomon were kings. It was found not long since engraved upon a tablet, after the manner of the days when records and accounts were kept on bricks. Its author was a gentleman of Babylonia, and it explains itself: "To my Bibi, Simil-Marduk—May Samas and Marduk, for my happiness grant unto thee a long and prosperous life. How art thou? Do write to me! I have come from Babylon, but I have not found thee there. This has greatly grieved me. It is absolutely necessary that thou shouldst come in November. Mayest thou, for the love of me, live for ever!" If his Bibi was his wife, as apparently she was, it must be admitted that Simil-Marduk was a model of conjugal politeness.—*Daily Telegraph.*

The Oldest Love-Letter.

THERE was once a posthumous and yet prematurely-born infant, so puny and wretched that, but for the sorrows of the widowed mother, little pains would have been taken to keep it alive, for it was her first-born. Charitable neighbours nursed it with amazing care, and so saved its miserable spark of life from extinction. After a delicate and monotonous youth, the child went to Cambridge; he was known in later years as Sir Isaac Newton.—*From Professor Mahaffy's "What the Greeks have done for Civilisation." (Putnam.)*

Nor the Battle to the Strong.

FROM Professor Mahaffy's thoughtful and scholarly volume we append another extract which is worth careful pondering: "The danger I see before this generation is that which came upon the Roman world insensibly, and which resulted in a decadence not arrested till it sank into the night of the Dark Ages. The later empire was content to take Greek art and Greek letters at second-hand, and to substitute Latin culture for the models which had educated their greatest masks. But the copy had not the life of the original. So we, too, with all our science, with our increase of material knowledge, and our restless running to and fro, may sink into an ugly, tame, joyless conglomeration of societies, for whom new discoveries supply hosts of new conveniences, but no return to the happiness and the contentment of a simpler age. Our purblind, toothless children may have their congenital defects vamped up by science, and without it we should indeed be stranded upon the reefs of despair. But happiness does not lie here—no, nor in motors, nor in turbines, nor in wireless messages across the globe, nor in daily newspapers full of inextricable fact and falsehood."

Simple Joys.

MR. DAY (of blacking fame) was originally a hairdresser, and was one day minding his shop when a soldier called and asked relief, on the plea that he needed a lift on the coach, in order to join his regiment before his leave had expired. The benevolent hairdresser gave him a guinea, whereupon the poor fellow exclaimed, "God bless you, sir; how can I ever repay your kindness? I have nothing in the world but this"—pulling out a dirty piece of paper from his pocket. "It is a recipe for making blacking. It is the best that was ever seen, and many a half-guinea I have had for it from the officers, and many bottles I have sold." Mr. Day tried the recipe, found the soldier's praise of it true, and soon began to make increasing quantities of the product, thus laying the foundation of a world-wide business.—*J. Aubrey Rees, in "The Grocery Trade" (Duckworth).*

A Story of a Guinea.

THE HEALTH OF THE SCHOOL.—Most of our readers are keenly interested in (if not indeed worried over) the keeping of the school in a perfectly sanitary condition, and one of the every-day problems is how to keep the dust from the desks and other furniture when the floor is being swept. There are several methods, more or less convenient and effective, but the Dust Allayer Company of 165 Queen Victoria Street, London, E.C., claim to have discovered the best of all. They offer for sale a preparation known by the name of Florigene, which on application lays the dust for two to six months or longer, according to wear. After this the ordinary daily sweeping is alone required to clean the floors. We recommend our readers to send to the above address for particulars of this preparation.

IN AT ONE EAR.—Every educationist is concerned with the training of the memory, and every examination student spends unhappy moments when the faculty fails him, as it so often does, owing to our lack of systematic training. As teachers we train this valuable faculty only in an incidental and haphazard manner, but the Pelman School of Memory tackles the matter on a scientific basis, and claims to have been of great help to people in many walks of life. We recommend our readers to study the pamphlet recently issued by this institution. It can be obtained on application at 4 Bloomsbury Street, London, W.C.

"COME UNTO THESE YELLOW SANDS."

(*From Shakespeare's "Tempest."* *The music by* J. BANISTER, 1630–1679; *"Chief of His Majesty's Violins,"* 1663.
Arranged, with the original harmonies, for the use of Schools, by T. MASKELL HARDY.)

This quaint old tune, written in 1667 and published in 1670, is the earliest known setting of Shakespeare's well-known words.

KEY F.
Not too slowly, and with the rhythm well marked.
VOICES IN UNISON.
Come un - to these yel - low sands, and then take hands; Curt - sied when you
rall.
have, and kiss'd the wild waves whist! Come un - to these yel - low sands, and then take hands; Curt-sied when you have, and kiss'd the wild waves whist!
1st VOICES.
2nd VOICES.
Come un-to these yel - low sands; Curt-sied when you have, and kiss'd!
p More quickly. cres.
Foot it feat-ly here and there, and, sweet sprites, the bur-then bear!
Eb.
F.
p 1st VOICES. cres.
p 2nd VOICES. cres.
p 3rd VOICES. cres.
p cres.

f
f VOICES IN UNISON.
f rall.
Hark, hark! Bow-wow. The watch-dogs bark: Bow-wow. Hark, hark! I hear the strain of strut-ting Chan-ti-cleer Cry, "Cock-a - did - dle - dow!"
(Burthen—dispersedly.)
1st VOICES.
2nd VOICES.
3rd VOICES.
tempo.

NOTE.—The Song may be sung in unison throughout, by omitting the repeats.

SHAKESPEARE FESTIVAL CELEBRATION, 1910, STRATFORD-UPON-AVON.

(To the Editor of "The Practical Teacher.")

DEAR SIR,—The Decoration Committee appointed by the above Association respectfully request your assistance and patronage to appropriately decorate the streets of the town of Stratford-upon-Avon for the forthcoming Festival.

Having taken an expert's advice, they find that a very large number of *wreaths* will be required, and have therefore decided to appeal to the heads of the public schools throughout the country for help in supplying a wreath in accordance with the enclosed specification. Should the distance or cost of carriage be too great, a donation of 10s. 6d. will enable a wreath to be purchased in the name of the school. All schools supplying wreaths will thus be taking part in the Festival in honour of the great poet, and will have their names inserted in the Official Programme and receive a letter of thanks from the Committee.

The Committee will be glad to give any further information you may require, and to hear that the pupils under your charge will help this year's Festival in the way suggested.

As many details have to be arranged, may I venture to ask you to be good enough to give this matter your attention, and let the Secretary, Festival Association, Guild Street, Stratford-upon-Avon, have an early reply.—I am, dear Sir, yours truly,

EDWARD DEER, *Mayor of Stratford-upon-Avon.*
A. D. FLOWER, *Chairman of the Governors of the Shakespeare Memorial Theatre.*
F. R. BENSON, *Director of the Dramatic Performances.*

SPECIFICATION OF WREATH.

The wreath to be composed of mixed evergreens—namely, laurel, yew, bay, rosemary, box, broom, and ivy, taking care the tender points are nipped out, as the wreath will have to last the entire Festival, extending over three weeks.

In order to avoid unnecessary expense of railway carriage, etc., the Committee suggest that—1. The wreath should be made on stout cord in one straight length of ten feet. 2. It be six inches in width. 3. It be not placed on a rigid frame, but folded up in a small box, taking care that it be well moistened ere dispatching. 4. The name of the school be plainly written on an official label. 5. The wreath be forwarded and directed to the Secretary (carriage paid) not later than Tuesday, April 19.

Our Art and Handwork Section.

AN EARLY ITALIAN PAINTER.

FRA ANGELICO (1387–1455).

BY W. E. SPARKES.

THE NEW MOVEMENT.

FLORENCE lies sheltered in a lovely valley, formed by long, sloping hills which surround it on all sides. On the crests of the hills and along their sides pleasant hamlets, gardens, and woods lie spread in the sunshine. But among them all none catches the eye more than ancient Fiesole, perched on the crest of a hill from which one may look down on Florence lying within its ancient walls, and overflowing into pleasant suburbs. The river Arno winds through the valley, and divides the city unequally, its bridges from this distance dwindled to mere bars drawn across the silver band, which flashes here and there in the sun. Five hundred years ago Florence was a small city, easily contained, with all its narrow and twisting streets, within its walls. A few stately buildings caught the light. There, in the heart of the city, stood the Baptistry, with its cupola; and near at hand, rising like a stately lily, was Giotto's tower, from which the bells called the Florentines to prayer, or, more stridently, crashed out the alarm when fire in the city, or enemies approaching from without, threatened death and destruction.

A FAMOUS FRESCO BY FRA ANGELICO IN THE CONVENT OF ST. MARK, FLORENCE—"THE ANNUNCIATION."

Much water has flowed under the quaint bridges since Giotto's death, but still his tower appeals to all by reason of its beauty, and perhaps still more because of its builder.

For Giotto is a name among many. Dying so long

ago as 1337, he has left memorials that defy time. His tower may fall and all his frescoes fade, but his influence on art will still remain. His was a stirring time: Florence had been torn for thirty years by civil war; Dante had been driven out an exile, harbouring bitter thoughts; the turbulent citizens had risen again and again in revolt: yet through the midst of these confusions a quiet influence was at work, reflecting the stirring times, and a symbol of the many changes working in the state.

Before Giotto's days, Italian art had become a dead thing—its artists mere machines copying former works without attempting to be original, and quite content if the frescoes they painted on the church walls, or the mosaics they put together with endless patience, brought them a living wage. The Church was supreme in art. She had set her seal on all work. For a thousand years St. Peter had been painted in this wise, the holy angels had their own proper set form, and what artist dared to take upon himself to have ideas of his own?

But these dead bones of art began to stir in a strange wind, which, first in fitful gusts and afterwards with steady force, began to move through the desolate valley. Learning began to revive, men awoke from their indifference, and a new light shone in the darkness.

Art began first to stir. Giotto and Cimabue were among the first to attempt to paint men and women as they might be seen in the market-place, and not as they had been painted again and again for generations, each artist copying from the works of men long dead and gone. For unless a man refreshes himself continually at the springs of Nature, his art must rapidly fall away into a lifeless thing.

Imagine, then, with what astonishment the Florentines awoke to the fact that painting had suddenly changed its form. What news is this of Cimabue daring to paint the Madonna with a Florentine woman as his model? Priests and burghers crowded to his studio, and were struck dumb at the sight. Their eyes had long been accustomed to pictures painted by formula; but here was a new creation, a living Madonna among thin ghosts.

If it is to be placed in the Cathedral, let us honour this miracle fittingly. Throw roses in the streets along which it shall be carried, hang silken banners from the windows, set the bells ringing, and call together the foremost men in the city and church to walk in procession before it as it is drawn on a rich car through the city! The Florentines did nothing by halves: they were thoroughpaced in all their affairs, whether in a civic fight or in a revival in art.

Giotto was Cimabue's greatest pupil. With keen eyes he noted the faces of his fellow-citizens in the market-place; trees and flowers were found to be worth a loving study; the meanest thing had its own interest: Art had come out into the open, leaving the dim churches where she had so long reigned in a deathlike stillness. Such revivals are not uncommon; Nature will always at last assert itself. Flowers had been painted before Giotto's time, but they were dead and lifeless; now the artists were like townbred children let loose in a meadow, where every daisy is a treasure and every buttercup a joy. This new-born delight in forms and colours, seen at first-hand, is the key to this new revival: it is so easy for art to run into a groove, so difficult to escape tradition; so easy to copy a style, so hard to act and see for one's self.

The tiny seed had fallen into a fit soil, in which it sent out its first rootlet, and from which it raised its tender plumule, growing year by year in strength, until, at Giotto's death in 1337, it was already become a flourishing tree, giving promise of rich fruit in the years to come. Had Cimabue, Giotto, and another artist about to be mentioned not laid down the foundations firmly, the stately palace of art reared by Raphael, Michael Angelo, and all the great later Italians, would not have been.

Fra Angelico.

Seventy years after Giotto's death a young Florentine artist, named Giovanni, left the city gate, and, breasting the hill towards Fiesole, followed the path worn by generations of men passing from the fortress to the city. After a stiff climb of three miles he reached the hill-crest, from which all Florence might be seen in the valley below. A little later he had entered Fiesole, making his way to the convent within the walls. For he had come to take the monastic vows; yet surely not because he was tired of the world, or soured with disappointment, or anxious to cut himself adrift from a tedious life.

This was no common brother who now put up his prayers in the monastery, or fulfilled the tasks which fell to his lot. He had brought his paints with him, and before long the cold walls of the refectory, the ambulatory, and the chapel began to blossom with saints, angels, and martyrs. Never had such creations been seen by the delighted monks. There were priceless manuscripts in the prior's chest—books of devotion in which every page was a marvel for care, every letter written with exquisite taste, and, above all, each initial a dainty picture with figures in red, blue, and green against a background of gold. These sacred images were now to be seen, life-size, serenely ranged along the walls of the monastery, and yet with an added beauty drawn from the young artist's practice in Florence.

Think for a moment what this meant. Giovanni had inherited Giotto's eagerness to search for beauty; he had been brought up in an atmosphere where all men breathed this new enlivening spirit; and he could see for himself how far art had moved since Giotto's death. Now, add to this another great fact—this, that he was much more than a craftsman eager to show his skill and clever deftness, or anxious to receive commissions from the rich to line his purse. To him, the Church and the Christian doctrine were first in his thoughts, and it was entirely as a servant to the one, and a teacher of the other, that he came to the monastery to put his talent in use.

For no truth is clearer than this—that a man reveals himself in his work. Giovanni's paintings have moved every age, but with a difference. Some have looked upon his frescoes as struggling attempts to picture great thoughts that would, by some means or other, have themselves expressed; others have looked on him condescendingly as a well-meaning and, in his own way, a commendable artist, but hardly to be taken seriously; whilst others (there are always these extremes) have written as though he were an entirely unskilled and unlearned monk, possessed by visions which he painted almost unconsciously.

The truth probably lies between these extremes. No doubt his delightful nature influenced his art profoundly. The name given him in the monastery, "Fra Angelico," is eloquent. It tells us how he was regarded by the men best able to judge; and, remembering how often

he painted angels and heavenly visions, we see how well the name describes his art.

Not that an artist is to be measured by his subjects. It is not the cowl that makes the monk. There was that free-living, drinking priest and painter, Fra Lippo Lippi, who, living only a few years after Fra Angelico, broke every rule of his order, and yet painted delightful "religious" pictures. There are some in the National Gallery. Browning sets the living man before us: we see this most unangelic priest fighting against the idea that a painter should care little or nothing for truth, but everything for feeling, as though skill in art must necessarily destroy the spirit of it!

"The Prior and the learned pulled a face.
* * * * * *
Give us no more of body than shows soul.
Here's Giotto, with his Saint a-praising God!
That sets you praising—why not stop with him?
Why put all thoughts of praise out of our heads
With wonder at lines, colours, and what not?
Paint the soul—never mind the legs and arms."

Lippo's protest against this is the artist's eternal protest against those who demand feeling without knowledge, or think skill worse than useless in art, as though one could speak well without knowing the language!

Fra Angelico's Art.

Fra Angelico has suffered more than most through this mistaken notion. It has become the habit to speak of him as the "inspired" painter, the "Christian mystic," the man who saw visions in his tiny cell, and, without training in art, was able to make the bare walls blossom with flowers, with angels in heaven, or visiting spirits on earth.

Charmed with his tender and delicate art, men have forgotten that he was first and foremost a great artist, so sensitive to beautiful lines and colours that it seemed impossible for him to draw the simplest thing, the smallest flower, without adding something from his own sweet nature. They read his life; they see him called to Rome to paint for the Pope; he refuses an archbishopric, smilingly asking that he may be permitted to die a painter; he hands all the money received for his work to the convent; and, forgetting that all these are the strongest proofs of his devotion to his art, as well as to the Church, they put him down as a man in a trance, moved by strange springs of action over which he had no control.

There was never a saner or more painstaking artist. True, he did not paint as the great masters in the next century, Raphael and the rest. They were the rich fruit of the tree planted by Giotto and Cimabue; he marked the stage when the young leaves began to show thick upon the spreading branches. During his life, art was gradually gathering strength; the little rivulets were flowing down into the valley; colour began to grow richer, drawing more exact; landscape for the first time peeped out as the background to sacred scenes; and a thousand other excellences had their beginnings in the frescoes with which Fra Angelico and his pupils beautified the walls of churches and convents.

All these streams joined to form the mighty river of sixteenth-century Italian art. It is useless to compare the river with the streamlet—Raphael with Fra Angelico; yet the tiny stream wandering down the hillside among the flowers, untainted and sparkling, may still have a grace denied to the river which flows through a town, bearing heavily-laden boats, but no longer fresh and pure.

So far as knowledge goes, it is easy to see that Fra Angelico's art was less than Raphael's. In spite of this, he was a great artist. There were few men in those early days with his knowledge of art, while his sincerity and insight leap to the eyes. He was sensitive to dainty colours and delicate forms; he could catch the spirit of action, and could read beneath the surface; and if he had not the accumulated knowledge to draw upon, as Raphael had, there are many things in his pictures that appeal with astonishing force. He was perfectly simple with the best form of simplicity—an intense love for his art.

There are clever paintings in the world, amazing in their knowledge, yet leaving us quite unmoved, because the artist is bent upon showing his cleverness, and invites us to see what a dashing fine fellow he is. There are also crude pictures that reveal a refined nature unable to express itself fully from want of means. "Honour showeth in the meanest habit."

Now, although Fra Angelico knew less than Raphael, he stood among the first in his own age. He had reached the high water of a continually-rising flood; he was, above all else, a true and sensitive artist in feeling. I mean by this that he knew how to draw figures, buildings, and landscape; how to group them; how to harmonise his colours; he had a deep and abiding love for ancient art, just then a passion among the most learned men in Italy; he understood trees and flowers; greatest of all, he could read and paint human character.

Let us look at one of his paintings in proof of this.

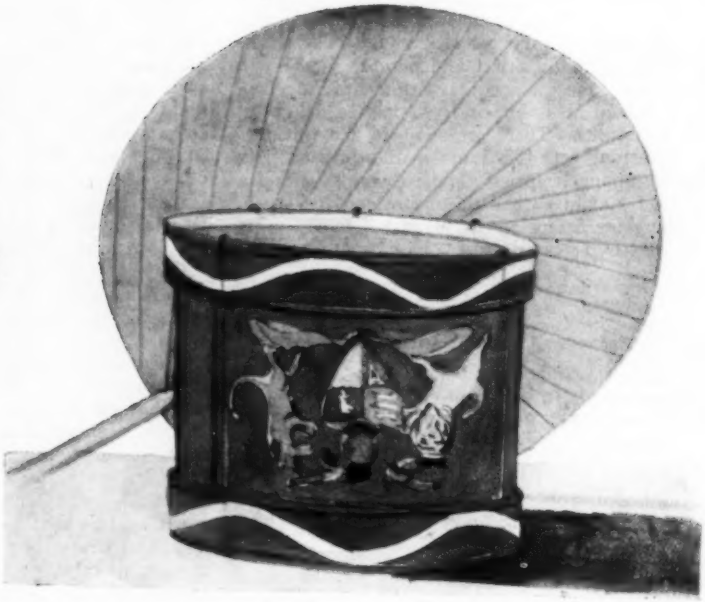
"The Annunciation."

This is from a painting on a church wall. I will say little about the spirit of such a painting: it has too long been the custom to speak about Fra Angelico as though he were a preacher first and an artist last.

I like to think of him on the day when he had put the last patient touch to the picture, and stood back to look at it. What care he had taken to set out his subject; how he had altered this and that; the immense pains he had taken with the smallest detail;—all this crowded in upon him: surely he had not won his way to such success without many failures and much disappointment. None knew better than himself how far his performance had fallen below his ideal. Yet, in spite of all, the most angelic painter would be more than human if he did not look with some pride upon his finished work, or flush with pleasure as he listened to the delighted cries from the monks and citizens called in to see the picture; but whilst the crowd were moved by the sweet faces (and you may see in the National Gallery what exquisite faces he could draw), Fra Angelico would edge round to where his fellow-artists were standing comparing notes. I think he would be more than mortal if he did not listen to their criticisms eagerly, and consider them before all the praise showered upon his picture by the crowd. The censure of one of these would outweigh a whole theatre of others.

He would hear the artists point out to each other how skilfully the Virgin Mary was framed off from the angel Gabriel, and yet one in action with him; how finely Fra Angelico had placed her head in the centre from which the circular arc was struck, repeating the golden halo about her head. They would notice the angel's wings—those "hawk-like" wings he always gave his

1



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HONOURS PAGE.

spiritual messengers; and from their own practice they would see the subtle way in which the artist had placed the wings, so that their outer curve should sweep round to lead the eye towards the Virgin's head. For though there are two figures, she is the more important, and the one to whom all lines must be led. "Look," they would say, "the good priest has placed a little window near her head; he has set the palings so that their upper lines meet Gabriel's wings and carry on the line; see, too, how all the capitals on the pillars are set on the same level! Truly, though Gabriel is a fine figure, he is of less account than the Virgin! Yet Fra Angelico had inclined her to receive the news, so that both figures are contained within one arc. See the softly falling hair! the hands, how well-drawn! And the good priest must have studied the drapery from the real thing—it falls so easily and with such grace. Sure, with all our skill, none of us could better those flowers in the garden, every one from nature. It appears, too, that Fra Angelico has eyes in his head. He understands ancient Roman art, and loves it, as we do; it shows in his round arches, smooth pillars, and carved capitals.

"Do you know he has painted such an Annunciation as this before now? In his last, you might see Adam and Eve weeping as they were driven from Paradise by an angel with a flaming sword. But in this fresco he has painted the Garden of Eden cut off from the world by a fence. You see what he means by that? There is no door in the fence, but her Son shall open Paradise once again to mankind. And I would have you see that he knows how to make his bending figures still more graceful, by placing them in the midst of upright and horizontal lines—the pillars, the fence, and the terrace.

"The crowd does not see all this. They see that Gabriel has just alighted from heaven, for he has not yet closed his wings; he is just about to kneel, but has hardly yet touched the ground with his knee. They see how calmly the Virgin receives the messenger. This is not the first time she has seen visions. The good Fra Angelico has finely contrasted her quiet restfulness with the sudden and swift movement of the angel who has flown down like a bird from the sky. The Prior spoke well when he called angels the 'birds of heaven.'

"We can see how he built his picture, but we cannot for the life of us see where he could have met such heavenly faces. Certainly not in Florence. There he conquers us all."

Thus his fellows in art; and thus the most modern critics have pointed out the ripe knowledge, the skill and feeling of Fra Angelico, where former writers had dwelt upon his mysticism and inspiration.

Conclusion.

At the Victoria and Albert Museum is an extensive collection of photographs from the artist's works. It is delightful to see how versed he was in perspective, in landscape, in flowers; to trace his skill in painting materials and texture; to find him keen in catching character, for he painted portraits of his friends kneeling while crowds of ordered angels with harps and viols sing above them. He must have drawn much from life. His composition is perfect, his mastery of action astonishing, though he seldom set his figures in strong movement.

Best of all, one may see perfect pictures by him in the National Gallery, each angel with its golden nimbus and flowered robe. Rays of light strike across his pictures. The hands he draws are closely observed; but best and most delightful of all are the round, childlike faces, the very embodiment of joy and innocence. Afterwards, artists such as Botticelli introduced a sad note into their pictures of the Madonna; but Fra Angelico seems to have touched only on pleasant strings. His paintings are like exquisite poems, for he had all the feelings of a poet.

One is amazed to read that, a hundred years ago, students in Italy were forbidden by their professors to look at Fra Angelico's paintings, lest "the single view should suffice to destroy for ever in them the sense of *true* beauty."

No doubt there was in this a reaction against the foolishness which had grown round the praises of well-meaning men, who lost sight of his great qualities and exalted him as a preacher. There is no such thing as Christian *art:* art is to be judged by the same rules everywhere.

Yet it is true that choice spirits can infuse their art with such feeling as may lift their pictures into another plane from that occupied by the merely clever but superficial works which proclaim stridently their authors' skill. And with this in mind, one begins to understand why Ruskin and his followers turned back to the pre-Raphaelites for inspiration—to Giotto and Fra Angelico, and those early painters who, above all things, were utterly sincere in their art.

Le Père Marchese, a priest, wrote: "Fra Angelico employs material forms only as a veil to cover the splendour of his vision—a veil so slight that we can see the vision easily through it." But is not all true art a vision, quite irrespective of subject? A sincerely felt and sincerely painted landscape is no lower and no higher in art than a "religious" picture, wrongly so-called. Fra Angelico was both a saintly man and a great artist, but it is upon his art alone, and how far he was able to convey *artistically* the thoughts within him, that he should be judged. Where he falls short (as he often does) his pictures are so much the lower, however he may have struggled to express a great idea.

Mr. Sparkes will commence a Series of Articles on

"ART AND THE BOOK"

in the next Number.

HONOURS PAGE.

PRIZES awarded to the scholars whose names are given below :—

1. Robert Carr (9), Tillmouth Council School, Northumberland.

2. James Lindsay (13), Crookston Street School, Glasgow.

3. Fred Davies (age not given), Cromwell Road Council School, Weymouth.

4. R. Malcolm (15), The Academy, Broughty-Ferry.

5. Henry R. Soden (14), St. Margaret's Higher Grade School, Princes Road, Liverpool.

There is no need to describe the drawings this month. The reproductions are an exact facsimile of the originals, except that they are reduced to about half the scale.

Commended :—

Cedric Cruttenden (9), Barnsole Road Boys' School, Gillingham, Kent; Charles Briscoe (11), Barnsole Road Boys' School, Gillingham, Kent; Stanley Palmer (13), Barnsole Road Boys' School, Gillingham, Kent; Mildred Cleugh (15), Secondary School, Jarrow-on-Tyne; Joseph Stephenson (16), Secondary School, Jarrow-on-Tyne; Alan S. Gornal (14), Sulyard Street Council School, Lancaster; Ernest N. Dearden (13), Earle Road Council School, Liverpool; Muriel Jones (14), St. Margaret's Higher Grade School, Princes Road, Liverpool; Sydney Vickers (15), St. Margaret's Higher Grade School, Princes Road, Liverpool; Roderick Sharp (13), St. Margaret's Higher Grade School, Princes Road, Liverpool; Arnold Wilkes (12), St. Margaret's Higher Grade School, Princes Road, Liverpool; William Bibby (13), St. Margaret's Higher Grade School, Princes Road, Liverpool; A. Mills (13), Cromwell Road Council School, Weymouth; S. Coleman (12), Cromwell Road Council School, Weymouth; L. Daws (14), Wesleyan School, Gillingham, Kent.

Drawings for this competition may be sent at any time. They must be original, and not from copies, and may be executed in pencil, crayon, or brush. They should be of a reasonable size, and well placed on the sheet of paper. Each drawing should have the scholar's full name, age, and school address on the back. Pack flat, and address to J. Vaughan, 7 Campside Crescent, Langside, Glasgow.

EDITORIAL NOTES.

AT no time in the history of education has manual training received so much attention from educational authorities as at present. By common consent some form of handwork is recognised as being necessary to the educational development of scholars of all ages and in all types of schools.

In primary schools the principle was admitted some time ago. Most secondary schools still cling to the purely literary curriculum, but the circular printed on page 597 shows clearly the attitude of the Board of Education on the point, and the importance attached to the work.

We are specially glad to see that public bodies and private individuals alike are insisting on the educational aspect of the work—on the developing of the thinking as well as the physical powers.

MISS FARMAN'S article on the furnishing of a doll's house shows handwork of a character suitable and interesting for the juniors; Miss Macbeth's needlecraft scheme deals with the work of senior pupils; Mr. Young's work with the crayon is suggestive for pupils of all ages. Attention might also be directed to the seasonal sheet of budding twigs. These provide really excellent studies, and in the early stages of growth are suitable for quite young pupils.

We hope to see many such studies in black-and-white and colour being sent in for the Honours Page within the next month.

THE HISTORY LESSON AND DRAWING.

BY W. H. ELGAR.

ARMOUR.—PART II.

HAVING treated armour generally to some extent in Part I. of this paper, it now remains but to consider some of its more important details. Before proceeding to these, however, attention should be called to Fig. 20, to which some slight reference was made in the previous part, but the drawing was omitted owing to the length of the article. This drawing is a sketch, on blue-gray paper in black and white chalk, of a very late incomplete suit. Here the breastplate has a somewhat overhanging ridge, imitating the peas-cod doublet of the times; the visor of the helmet is in three overlapping sections, and the crest ridge has another ridge to keep it company, reminding us of the brim of a hat; while the thighs and knees are protected by a series of scale-like plates, often known as lobster tails. Lightness, strength, perfection of workmanship, and the protection of vulnerable points are all here combined.

Of armour details, without doubt the head covering is the most important, followed closely by those of the breast and feet.

Fig. 21 is a sketch in black and white chalk of a solleret belonging to a very complete suit for fighting on foot made for Henry the Eighth, now in the Tower of London. It would seem that the broad *bear's paw* shape is a translation into metal of the typical shoe of the times, as other parts of armour often were. The long points of the early sollerets (*à la poulaine*) often appear to have been inconvenient, for the knights at the battle of Sempach (1386), after dismounting, are said to have cut off the long ends.

Interesting as it is to notice the changes through which the sollerets passed, those of the helmet are doubly so, being worn as it was by almost every fighting man, whether otherwise armed or not. These, however, can scarcely be touched upon here owing to the great length of this article: the helmets of any one century could not be adequately treated in an article of this length. In many village churches helmets and gauntlets are found, and most certainly should be studied, as they make splendid drawings. Black and white chalk on brown or blue paper answer admirably. Several drawings from different positions should be

made, and little side-notes of hinges, pivots, sighting, ventilating, or hearing holes. Rough dimensions and remarks as to material, condition, weight, owner, whether for fighting or tilting, should be added if possible, the idea being to get a record worth preserving at the same time as practice in drawing. Fig. 22 is a sketch of a bassinet on a figure in Dover Castle;

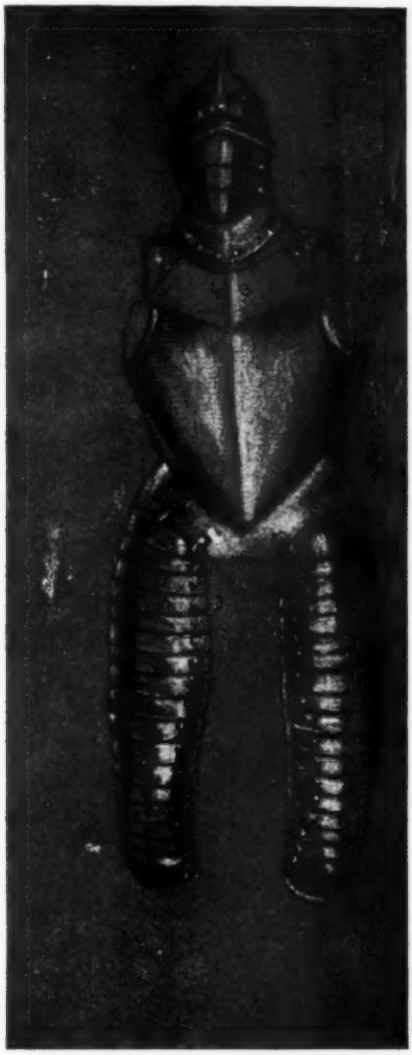


Fig. 20.

Fig. 23 gives an idea of the helm over Henry the Fifth's tomb at Westminster. This probably went over such a bassinet as Fig. 22. The loops for securing it, the slot for sighting, and small ventilation holes can be traced. A tilting helm belonging to Sir John Fogge (died 1490), now in Ashford Church, forms Fig. 24. It is very heavy, weighing nearly twenty-four pounds, and extremely strong (note the rivets and screws). The means by which it was hinged to the breast armour and the back plate, and the improvements in form,

Fig. 21.

affording more comfort and ventilation, are very evident. Fig. 25 is a form of head armour known as an *armet*.

Fig. 22.

It belonged to Sir George Brooke (Lord Cobham), and is from his tomb in Cobham Church, Kent. The great

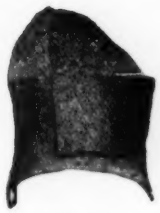


Fig. 23.

Fig. 24.

distinction between this form and those which preceded it is that the armet was provided with hinges, which

enabled it to close round the head, and consequently follow to a great extent the outline of the head and chin. Early armets open down the front, later ones at the side. Drawings of the casque, the morion, and the barred helmets of Cromwell's time might have been added, for they are all readily accessible to the writer. The reader is advised to seek them out and study them.

Fig. 25.

An intelligent study of armour certainly leads to a more perfect understanding of the battles in which it exercised so great an influence. It is only necessary to examine a series of battle plans extending over a considerable period to be convinced that the arrangements of the troops depended in no small degree upon the arms and armour used. The subject could have been treated from this point of view. Space only has prevented arms as well as armour from being touched upon. Possibly the writer may be allowed to attempt these and other aspects on a future occasion.

A sketch of a late breastplate (Fig. 26), showing the strengthening ridge (*tapul*), is included as a suggestion, for there are numerous examples to be found, and they always make excellent objects for drawing, to say nothing of modelling. Indeed, no better method could easily be found for giving true ideas of the smaller parts of armour than by modelling. For this reason two of our examples are repeated in clay in the round, the work of beginners, and a fair type of what might be

Fig. 26.

expected from the higher classes of primary schools. Only those who have attempted modelling such objects know of its difficulties and advantages, and the necessity for a thorough knowledge of the form from every point of view. Consequently, if the object cannot be removed, and the modelling has to be done from sketches, these must be from carefully-selected points, and marked with at least approximate dimensions.

Fig. 27 is a fair type of such studies, which, it will be noted, shows three views of each object—side, front, and top—and these are placed in line with one another, much in the manner of architectural and machine details. In work like this the more system the better.

Fig. 27.

THE OUTLOOK OF PRACTICAL TEACHING IN SCHOOLS.

EDUCATIONAL HANDWORK ASSOCIATION (LONDON BRANCH).

THE fifth annual meeting of the above Association (London Branch) was held on Saturday, February 12, at 10 Pembridge Square, W., through the courtesy of Mrs. Walter Ward, who, as on former occasions, again entertained the members of the Association.

The hon. secretary reported that the membership of the Association was increasing in a satisfactory way, forty-five new members having joined during the past year. The annual report also emphasised the important educational work done during the past twelve months by the lectures on various aspects of educational handwork delivered under the auspices of the Association by highly distinguished public men. It was one of the aims of the Association to arouse general interest in the various phases of hand training, and to educate the public to appreciate its value.

For the same purpose a new periodical, called *Educational Handwork*, had been started during the past year. The holiday courses at Scarborough attracted no less than 189 students, while the Teachers' Training Classes, now being held in London, at Stroud Green in the north and Clapham Junction in the south, were attended with great success.

Dr. Kimmins, Chief Inspector of Education under the London County Council, was re-elected President of the London Association.

In responding to a unanimous invitation, he remarked that he thought it was sometimes wise to change the chairman; but in view of the important year's work before them, he had consented to accept again the post of president. He hoped to see this year the union of the two bodies interested in manual work in schools, and was sure that the joining together of the Manual Training Teachers' Association and the Educational Handwork Association would be productive of nothing but good. The aims of each Association were similar, and by uniting their forces they would avoid all danger of overlapping. Dr. Kimmins said that he would not give them a formal presidential address—they must not expect him to do that each year—but he would like to have a little talk about the outlook for the coming year; and in his opinion at no time was the prospect so promising for the development of handwork as an educational force as the present. They had endeavoured during the past five years to educate public opinion on this important branch of modern education.

One element in our favour was the spreading through England, as well as America, of the spirit and teaching of that great man, John Dewey, who was undoubtedly one of the greatest educational forces in America. He had the privilege of attending the meeting of the British Association in Winnipeg last year. This important conference was attended by a large number of professors from the States and from Canada, and one thing that struck him very forcibly was the marvellous influence of Professor Dewey. It was not that he had written a great deal on modern educational ideas. His works were at present in the form of addresses and monographs, and had yet to be collected and published in an important book form. But what he *had* said and written appealed strongly to those who, like himself, were studying educational questions in the light of modern psychology; and they felt, after reading one of these thoughtful addresses, that these ideas coincided largely with what they had been thinking about for years, but had hitherto been unable to express. He had recently visited the Fielden school at Manchester, and found them practically living, as it were, on Dewey's little booklet, *The School and the Child*. When in Canada last year he had taken the opportunity to visit many educational institutions. He found that in many of these, as at Toronto and Montreal, there were very important provisions made in the course of university training for instruction in various forms of manual work. An important development was that known as household science. They were not quite clear yet as to what household science really included, but the great point was that they were all moving in a practical direction. It was curious to note that in Canada the building seemed to be considered before everything else, even before the proposed curriculum was decided on; but it was noticeable that practical handwork was invariably provided for in the arrangements of the building, and consequently found a prominent place in the curriculum. He had the keenest pleasure in being allowed to inspect the celebrated Macdonald College, and was particularly favoured in being the guest for a time of its enthusiastic and learned principal, Dr. Robertson, one of the foremost educationists in America.

Dr. Robertson was originally a schoolmaster; then he undertook the management of the Department of Agriculture in Canada, and introduced so many important changes and improvements that he fully established his reputation as a born organiser.

In Canada there was at that time no manual training at all. Dr. Robertson was asked by the Government to do something for the schools in this matter, as it was beginning to be felt that no school would be complete without its handwork side.

But there was no scheme thought out, and no teachers trained to take up the work. With characteristic thoroughness Dr. Robertson spent eighteen months in England, examining the work done here, and he also selected twenty English teachers to take over to Canada.

He managed to instil into them something of his enthusiastic spirit. They already had the necessary technique and skill in teaching, and under his guidance they gradually developed a system on more constructional lines than they had been following in this country. They became known as "Robertson's men," and were not tied down too much by tradition. They were in a new country, they were given a free hand, and were only expected to make the best use of the time allowed. So they kept experimenting, and gradually developed a very valuable scheme of handwork.

Professor Robertson's address at the Winnipeg Conference was on "Manual Training and Nature Study;" and though he was supposed to speak for three-quarters of an hour only, he kept his audience spellbound for double that time. He (Dr. Kimmins) thought that public men talked much better in America than they did in the old country. They were accustomed to express themselves freely, forcibly, and clearly. Even if what they said was not of much value, they certainly said it fluently and well.

So it came to pass that when, in the Legislative

Chamber, which had been lent them for the conference, Dr. Robertson sat down, after pouring forth a torrent of eloquence for an hour and a half, there followed a most striking tribute to the power of the lecturer. The audience seemed stunned for the moment, and there was a short but most impressive silence. It seemed impossible for them to adequately express their feelings at once. A great burst of applause came at last as the audience seemed to realise that just at that moment there were only two things of any consequence in the world, and they were—Manual Training and Nature Study.

He was very glad to have the opportunity of personally seeing what was being done at Macdonald College. This institution was situated about nine miles from Montreal. It was closely connected with Sir William Macdonald, who generously gave one million pounds to found it. Dr. Robertson had visions of future Canadian education, and Sir W. Macdonald gave this vast sum in order that the dreams of the enthusiast might become realities. Dr. Robertson was to manage everything in his own way—to build the college, find the men to teach, make the curriculum, and himself act as principal. And well had he justified the confidence placed in him. He was a grand organiser and manager. When he (Dr. Kimmins) arrived at the college he was shown into the principal's study, and had to wait for ten minutes until the busy organiser was disengaged. There were five telephones in the room, and the chief was keeping them going simultaneously, giving his orders and instructions. There was no department of which the principal was more proud than the department of Household Science. This was for young women, who were desirous of preparing themselves for future usefulness by studying everything which would enable them to become better housewives. The course laid out involved hard study for two or three years, and there were crowds of young women willing to pay the fees and work hard so that they might thoroughly equip themselves for the business of married life.

Then there was a training college for teachers, with a very wide curriculum so carefully thought out that every possible objection he could make to the course was answered instantly by the principal. The Manual Training Department was gradually developing from the top downwards. It was easy to decide what the senior course should be, but the work best suited for the very young children was still the subject of experiments. Specimens of proposed schemes of work were sent to the conference for consideration.

The elementary school in connection with the college was also used as a practical school of gardening. A piece of land was attached to the school, and divided into small plots. One corner of each plot was reserved for each child, with a central portion used as a co-operative garden. These school gardens, with others known as industrial gardens, were used for all sorts of agricultural experiments.

For instance, they had been trying to improve the yield of corn by the experiment of selecting the best grains year by year, and it was clearly evident that this selective process resulted in much better and finer crops. Standing side by side with the ordinary unselected corn, the flourishing condition of the former contrasted strongly with the poor quality of the latter, and formed a striking object-lesson of what might be accomplished in this direction.

Then he would like to refer to a very interesting experiment which had been made in poultry-farming, although it was a little apart from the subject of that afternoon's address.

In a country where 20° of frost was a very common temperature in winter, great difficulty had been found in keeping poultry, and particularly in getting the hens to lay regularly.

But the authorities started with the fixed idea that the Almighty intended hens to lay eggs all the year round, and that they must find out the reason why such was not the case.

Well, they had tried a great number of experiments, and had come to the conclusion that the principal reason was that the hens suffered a great deal from cold feet. So the bundles of cabbage leaves which the hens were given to pick were hung a short distance out of their reach. In order to get at this food they had to keep jumping: it was a sort of organised game for the hens. In this way the feet were kept warm, and the hens commenced to lay with great regularity, even in the depth of winter. Another method in vogue at the Macdonald College was to bury the food under four inches of rubbish. The hens had to keep scratching in order to get at it. This plan also answered well, resulting in a plentiful supply of eggs all the year round. A record of each hen was kept for three years, and the results were tabulated for reference. To prevent the eggs from freezing, a little hinged door was used. This admitted the hen to her nest when she wanted to lay, but prevented her return. In this way she was made to keep the egg warm until it was collected.

Returning to the subject of his address, he noted that in the London schools there was a great eagerness for taking up some form of handwork in the lower classes. The requests of head teachers for the necessary material were very numerous. It had been thought best to wait for the report of the Conference on Handwork in Schools, now sitting in London, before granting the material asked for; but the teachers were so eager to do something for the younger classes that they had been allowed to make a start at once. It was very important that there should be co-ordination between the manual training work and the work done in the standards. It was also very necessary that the instructor of handicraft should be on the regular staff of the school. The time was past when the manual training teacher was the Cinderella of the staff.

In conclusion, he would express a hope that the subject of handicraft as a means of education would at some future time be taken into serious consideration by leading universities. In his opinion a faculty of handicraft was most desirable.

Mr. Bosworth, in proposing a vote of thanks to the lecturer, said he hoped it would soon be possible for men in training at our universities to be able to take up the subject of handwork as naturally as they did other subjects. If the older universities of Oxford and Cambridge would not move in the matter, perhaps a more modern one, such as Birmingham, would lead the way in this important reform.

NEEDLECRAFT FOR PRIMARY AND SECONDARY SCHOOLS.

BY ANN MACBETH AND MARGARET SWANSON, INSTRUCTRESSES AT THE GLASGOW SCHOOL OF ART.

PART II.

THE work of the senior division lies between nine and twelve years of age, and we intend to consider in this article the material and construction suitable from nine to eleven. For at eleven years of age the majority of children attain normal vision, and this is the fitting time to introduce the child to white thread on a white background. And even then long seams should be avoided; the lack of interest in one long continuous white seam is fatal to any mental activity.

On the other hand, by understanding the construction and nicety of finish on a small scale, the preparation is surely proceeding for cutting-out and tacking quickly together, and evenly machining a set of underclothing, between the ages of twelve and fourteen—that period known as the "supplementary stage," which was qualified lately as "the crown and completion of the primary school."

Yet needlework does not exist for underclothing alone, nor yet for outside clothing, nor yet again for household use and embellishment, but for all together—so that each young citizeness may be able to express right principles in her work.

Quoting from Circular 719: "The principles of good ornament are far reaching in their educational value, and they can nowhere be taught more directly than in some form of handicraft—that lies in training the eye to appreciate simplicity, and to distinguish between the true simplicity that comes from perfectly honest and well-finished work, and the false simplicity which is due to lack of skill and to poverty of invention."

By way of retrospect, we note that the child amidst certain conditions may have experimented, or, as kindergarteners would say, "played freely," with other texture than calico. So much the better if all could thus "play freely." For at nine years of age we take up a second texture—flannel—which henceforward will go definitely side by side with calico for the rest of the school period.

Flannel has many things to commend it to the child; the warmth, the weight, the elasticity, all afford a direct contrast to the less yielding calico, and interest is roused as to the kind of stitch which can hold the springy material to the shape desired.

Then is applied that law known to all educationists —the law of association of ideas, and the child finds that *herring-boning* is but another form of tacking from left to right, in zigzag fashion, specially adapted for an elastic material such as flannel is.

Diagram 6 illustrates the first application of the new texture, flannel, and the new stitch, herring-boning, to the construction of a needlecase, which shows still further the application of "*sewing on of tapes*," *pinking*, and *darning*. The colour scheme has all kinds of possibilities; blue flannel may be used sewn with orange embroidery thread No. 30 (Clark and Co., Paisley), and No. 5 Scientific Needles. Very pleasing colours in mending yarn are quite easily procured, are cheap and quite good for the worker at this stage to use in place of the embroidery thread. Tapes, braid, galloon, any narrow selvedged material may be used for fastening the case, and are top-sewed to the right side and hemmed along the other three sides, when placed on the inside of the case; if the tapes are placed on the outside of the case, they are tacked by a small square of close tacking.

On no account should canvas be tolerated for practising herring-boning. The open canvas means counting threads; means keeping the material within close range; means constant exercise of the ciliary muscle —stretching the eye to the deterioration of vision. (We are glad to note in No. 6 of the suggestions in Circular 730 that "counting threads" is tabooed.)

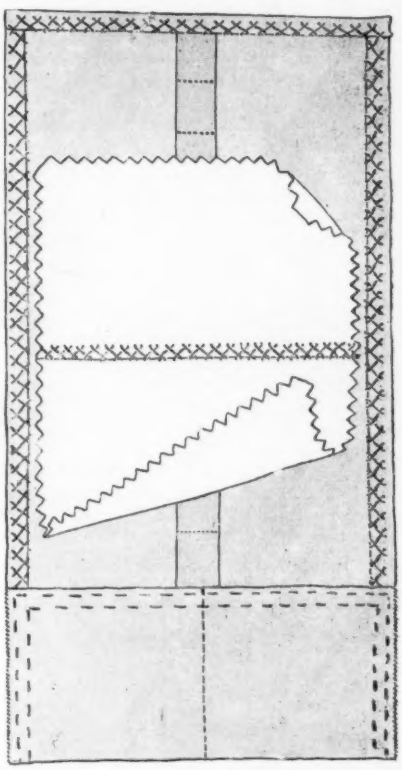
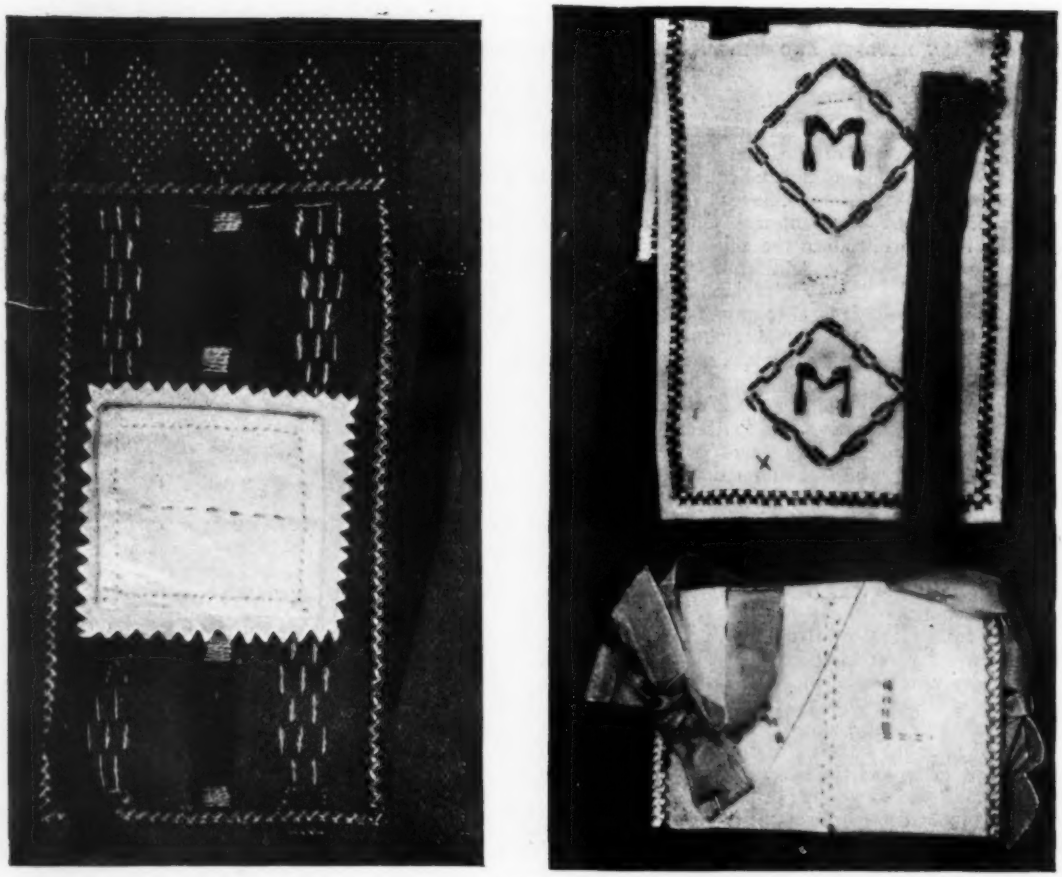


DIAGRAM 6.—A needlecase, to show the herring-bone stitch and sewing on of tape.

The eye discriminates colour naturally; in fact, the colour sense demands and selects its food in this respect, as the sense of taste demands and selects a "sweetmeat." The joy of colour is a stimulus constantly to the child, and we guide her to regularity and exactness in spacing through colour distinction—*not* by *counting threads*.

Darning, known at this stage as single darning, is merely repeated rows of fine tacking, and can be used effectively as a decoration at those places where the nap or ply is likely to be worn off.

Diagram 7 shows a cooking-apron, the type we have chosen to illustrate *pleating* (another and important exercise at this stage.) The material is unbleached calico, with false hems, shoulder-straps, and strings of a contrasting colour—say green, hemmed down with blue



EXPERIMENTS ON DIAGRAM 6.—The dark-coloured needlecase is blue flannel, herring-boned, and run in lozenge-shaped masses with orange silk. That with the initials is on white; stitching and braid in rose-coloured wool. The small folded one, white, with lilac stitching and lilac ribbons to tie it.

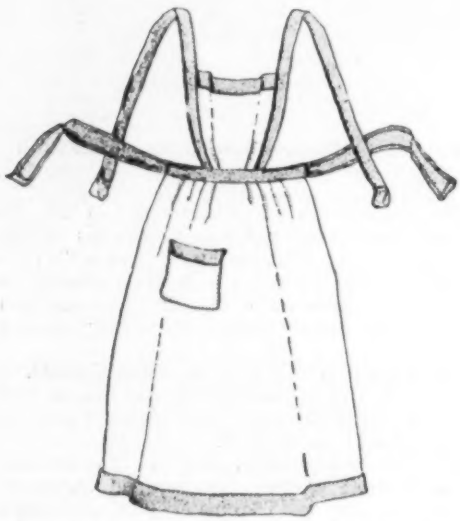


DIAGRAM 7.—An apron, introducing false hems and pleating.

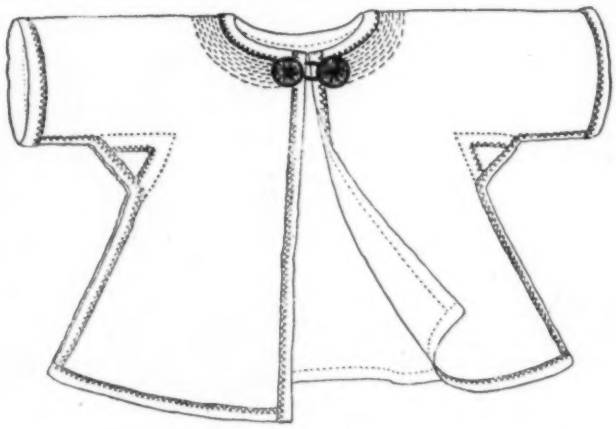
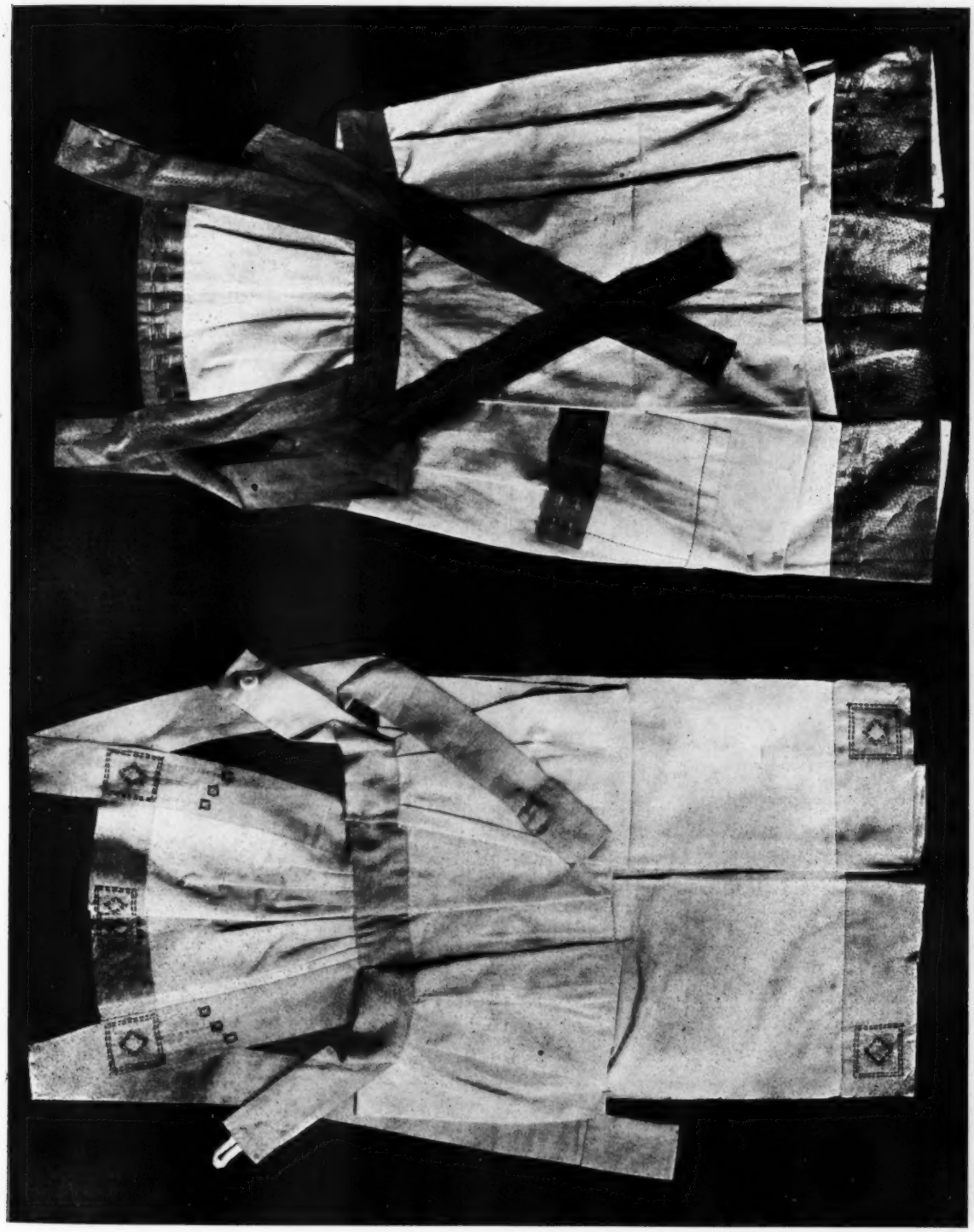
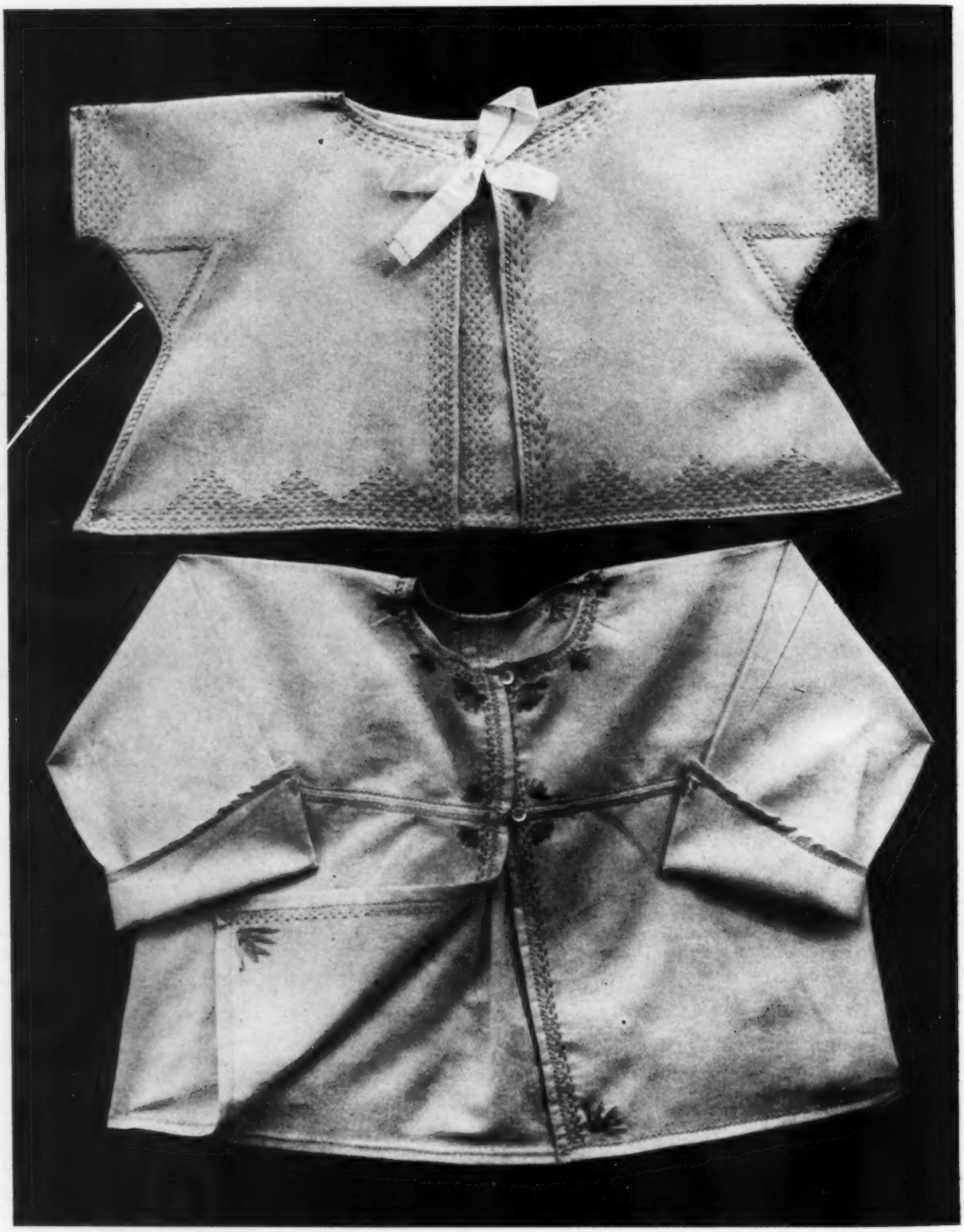


DIAGRAM 8.—A baby's jacket, showing flannel seams, a triangular gusset, and darning.



EXPERIMENTS ON DIAGRAM 7.—The left-hand apron has straps and hems sewed with blue; the square patterns are "tacked" with black and white. The other example is bordered with darker green, sewed with deep checkered border, "tacked" in two shades of purple.



Finished specimens of child's jacket, showing the application of the principles explained in Diagram 8. The material is white flannel, and the ornamental stitches are worked in No. 1 with gray and pink coloured thread; in No. 2, in two shades of heliotrope.

or mauve. The skirt, the bib, and the strings show *graded pleating*. Loops are tacked at the end of the shoulder-straps, and through the loops the waistbelt or strings pass and are fastened. Embroidery thread No. 30, Scientific Needles No. 5, are used.

Diagram 8 illustrates a type for children between ten and eleven. In it the worker discovers by the "doing" the advantage of the curve in the infant's flannel jacket, while, incidentally, she learns the value of the gusset. The seams are joined by running (fine tacking again) and herring-boning, and the neck is strengthened and decorated by single darning. The materials are soft cream Saxony flannel, blue embroidery thread No. 30 (Clark and Co., Paisley), and No. 5 Scientific Needles. Here again the colour scheme is full of interest and possibility.

MANUAL INSTRUCTION IN SECONDARY SCHOOLS.

Circular 740.

THE Board have not laid down any strict definition of the nature of the manual instruction for which provision should be made under Article 8 of the Regulations for Secondary Schools, nor have they prescribed the amount of time that should be given to it. While, therefore, a large discretion is left to schools in the matter, it is desirable to indicate what kind and amount of work will be regarded as normally satisfying that regulation.

The object of the Board is to ensure that pupils should at some stage, at any rate, in their secondary school career, receive some definite and systematic instruction of a progressive kind which will train them to observe accurately, to use their fingers skilfully, and to exercise forethought and intelligence in the use of means towards definite ends in production.

For pupils below the age of twelve, provision should always be made for work to develop accuracy of observation and skill of hand. For this purpose no special workroom or elaborate apparatus is needed. Among suitable subjects may be named plaiting and weaving (for quite young children), basket-work, modelling in clay or plasticine, and cardboard work in connection with geometrical drawing.

For older pupils this kind of instruction ought to be further developed. For boys, a course in woodwork (and, where this can conveniently be added, in metal-work also) is educationally the most useful. Any course in wood or metal work ought to be thorough. True and accurate work is absolutely essential for the object in view, and this cannot be secured without a bench and proper tools. Slovenly teaching must above all things be avoided. Knowledge of, and skill in the use of, a few good tools are essential. A workshop fitted with benches and sufficient apparatus is desirable in all well-equipped schools. Almost any room that is well lighted, and sufficiently warmed and ventilated, may be used for this purpose. The general indirect educational value of doing work under orderly conditions and with proper equipment is very great. But this special provision will not be insisted upon in all cases, and the Board will have regard to the circumstances of each school in determining what kind of provision short of this it may be reasonably required to make. Of the other subjects named above, clay modelling in connection with plenty of free drawing is probably the best suited for pupils over twelve. It is equally applicable to boys and girls.

It is not required that manual instruction shall be given throughout the school, or even in each term of a year in which it is given. It may often be desirable to take it for only one term in the school year, and to give more time and attention to it then. Such an arrangement, with careful planning of hours, will enable even a small workshop to be used by large numbers of pupils in the course of the year. It will also allow of the instruction being given in periods of sufficient length. For wood or iron work in particular, a period of two hours, including the time given to the preliminary drawings, is found to be necessary in order to produce the best educational results. With such a period, taken once a week throughout a term, good and solid progress can be made. For other kinds of manual instruction shorter periods may be found sufficient. But it is important to remember that in all cases the educational value of the work is largely increased by its being so arranged as to require some continuous and concentrated effort from the pupils.

For girls some kinds of needlework, with the subsidiary processes of designing, cutting-out, etc., give good training to both hand and eye. Gardening, for both boys and girls, where facilities for it exist, also gives this training, together with healthy out-of-door exercise.

In all these cases it should be borne in mind that the training sought is of a practical nature, and that the work done should therefore not confine itself to exercises in method, but should be directed concurrently, and almost from the first, towards the production of actual things. This will at once stimulate the interest and develop the practical intelligence of the pupils. It should also be understood that the subjects mentioned here do not profess to be an exhaustive list of the kinds of manual instruction suitable for secondary schools. Any well-planned course of progressive instruction which, in the opinion of the school authorities, will carry out the general object aimed at may be submitted for approval, and will not be disallowed unless it clearly fails, through insufficient amount or inferior quality, to meet the object which, as stated above, the Board have in view in the regulation. W. N. BRUCE.

BOARD OF EDUCATION, WHITEHALL, S.W.,
February 1910.

The current issues of the *Manual Training Magazine* contain some well-written articles on Manual Training in Europe, by the Editor, Mr. C. A. Bennett. It is always interesting "to see ourselves as others see us."

CONSTRUCTIVE WORK IN PAPER.

BY AGNES E. FARMAN.

A Doll's House.

THE usual routine of paper-cutting work in the younger classes of a school—the making of trays, sweet-boxes, etc.—may be varied in an interesting way by constructing a doll's house. It is an exercise that

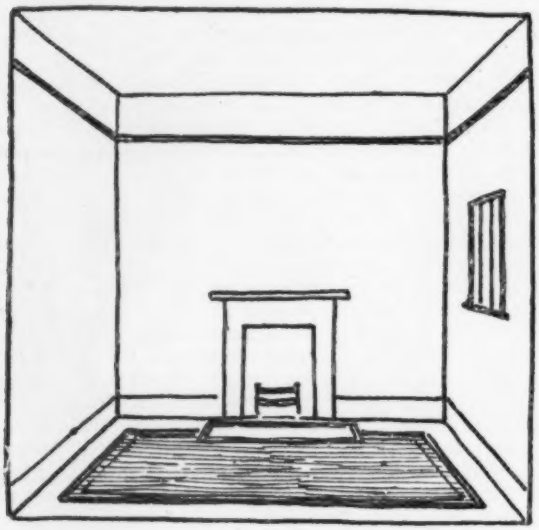


Fig. 1.

two or three classes may take part in, the older girls making the more difficult pieces of furniture, the younger the easier ones. The best pieces from each class can be used in furnishing the rooms, or one class may undertake the bedroom, another the sitting-room. For the rooms themselves square cardboard hat-boxes are suitable, and can be obtained from any milliner or draper for a few pence, one of about 14 inches square being a convenient size. The lid is not used, but the box is turned on one side, so that the opening represents the fourth side of the room; the real bottom of the box forms the side of the room opposite to the spectator (Fig. 1).

The room should be properly papered, and it is quite possible that the help of the teacher may be needed in this matter, as it is not easy for children to paste large areas of paper on a surface smoothly. The ceiling should be white, the walls of some plain colour—a grayish green, not too dark, looks well. The carpet and rug may be actual pieces of thin material, or a plain piece of paper in keeping with the colour of the walls. If they are of paper, a border should be ruled round each by the children, and tinted. A picture rail may be suggested by a coloured band in harmony with the paper, pasted where the wall-paper comes in contact with the frieze, which may be white like the ceiling. The skirting board can also be shown by a broader band of the same colour, pasted round the bottom of the wall. These bands should be ruled, coloured, and cut out by the class, though the teacher's help may be required to paste them on accurately. A fireplace and window should also be ruled out and pasted on the walls. Figs. 2 and 3 are suggestions for these; but it will be better and more interesting to use as models the windows and fireplaces of the room in which the class is working. Their place in the rooms will, of course, depend on the proposed arrangement of the furniture; and it is well not to fix them permanently on the walls till the furniture is completed, so that the class may help in the final scheme.

The furniture is all built on one plan. A square or rectangle, folded and pasted together into a cube or rectangular solid, forms the body, and this is completed by one or two other pieces pasted to the sides or ends. Fig. 4, for example, shows the two parts of the chair ready to be fixed together, Fig. 5 the two parts of the settee. Slight modifications of the shapes are suggested in one or two cases, and these can be still further varied, or other pieces of furniture substituted, provided their plan and construction are simple. When once the idea of putting the parts together is grasped, all kinds of things can be built up in the same manner. The paper used should be fairly thick, a dark colour being chosen for the sitting-room, a light one for the bedroom furniture.

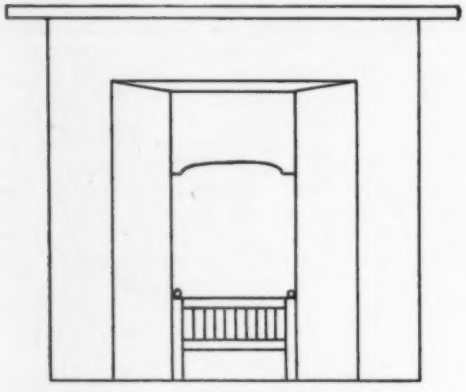


Fig. 2.

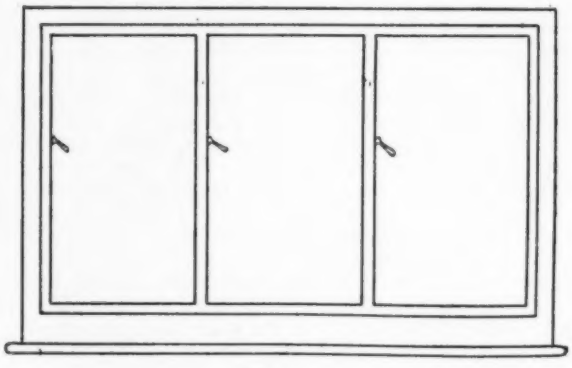


Fig. 3.

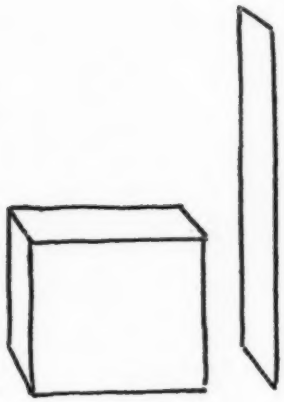


FIG. 4.

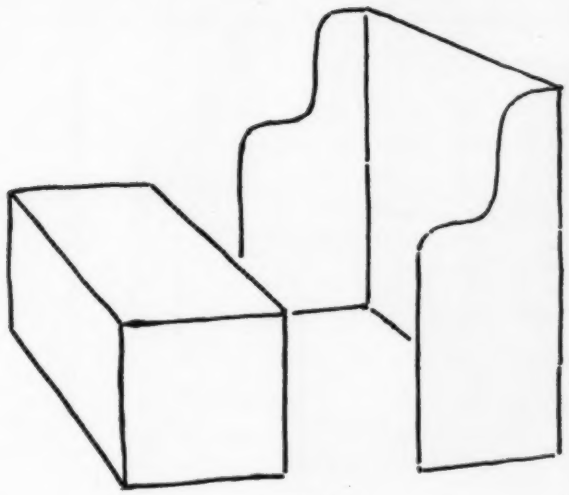


FIG. 5.

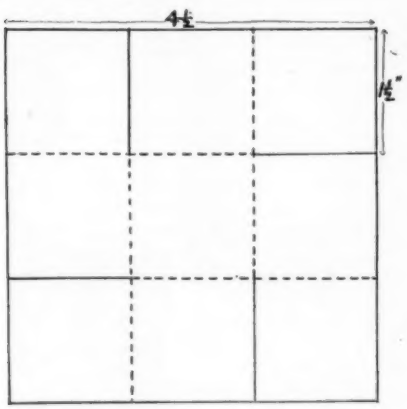
CHAIR.

Paper Needed.

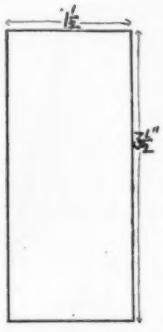
Sheet I. A square of 4½ in.
Sheet II. A rectangle of 3½ × 1½ in.

Instructions for Working.

Divide Sheet I. into nine smaller squares of 1½ in. and rule with dotted and firm lines, as in diagram. Fold on dotted and cut on firm lines. Fold up and paste into cube form. When dry, paste Sheet II. firmly to one side of cube. This forms the back of the chair. The top may be left straight or curved, as in sketch (Fig. 6), or it may be treated in various ways, as in Fig. 6*a*.



CHAIR.—SHEET I.



CHAIR.—SHEET II.

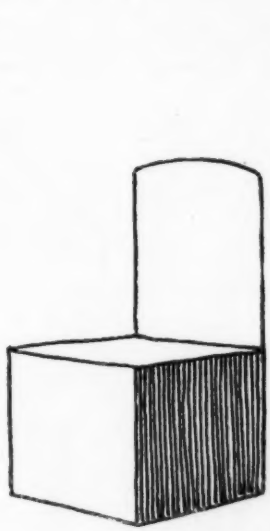


FIG. 6.

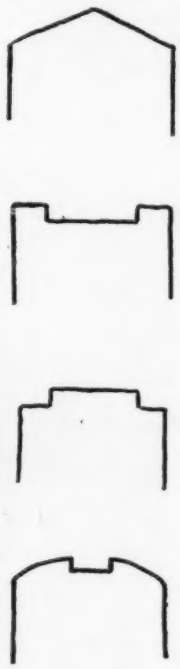


FIG. 6*a*.

ARMCHAIR.

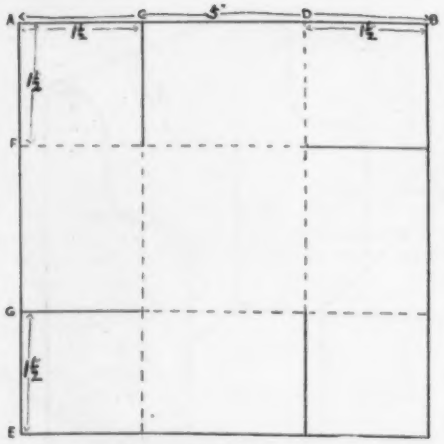
Paper Needed.

Sheet I. A square of 5 in.
Sheet II. A rectangle of 4½ × 6 in.

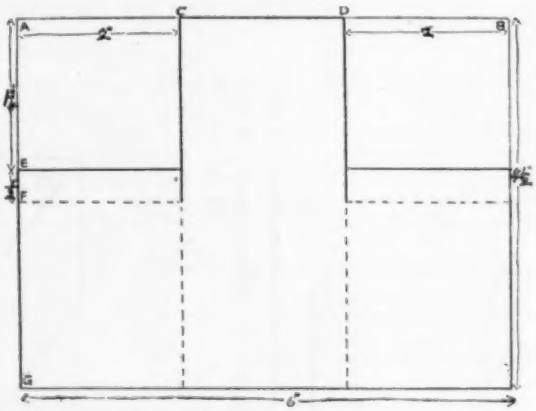
Instructions for Working.

Sheet I.—From corners A and B along line AB mark off points C 1½ in. from A, and D 1½ in. from B. On line AE mark off F 1½ in. from A, and G 1½ in. from E. From C and D draw lines parallel to AE. From F and G draw lines parallel to AB. Make lines firm and dotted, as in diagram. Cut on firm and fold on dotted lines, and paste up into block form for seat.

Sheet II.—From points A and B along line AB mark off C 2 in. from A, and D 2 in. from B. From C and D draw lines parallel to AG. On line AG mark off point E 1¾ in. from A, and point F ½ in. from E. From these



ARMCHAIR —SHEET I.



ARMCHAIR.—SHEET II.

two points draw lines parallel to AB. Complete diagram with firm and dotted lines. Cut away the corners at A and B along the firm lines, and fold on the dotted ones. The sketch (Fig. 7) will show how the arms are folded horizontally, and how the sides are folded round and pasted to the sides of the seat. The shape of this chair may be varied considerably by altering the form of the sides; for instance, a simple curve as in Fig. 8 will give a chair as in Fig. 9. The more elaborate curves of Fig. 10 will give that of Fig. 11.

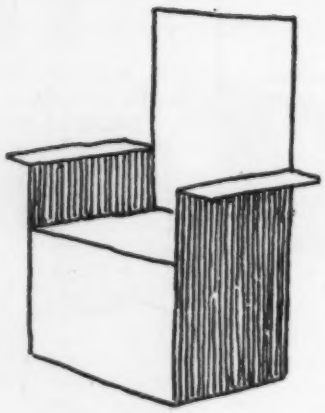


FIG. 7.

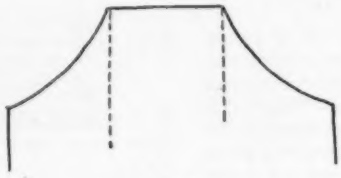


FIG. 8.

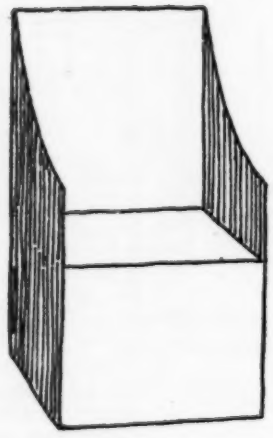


FIG. 9.

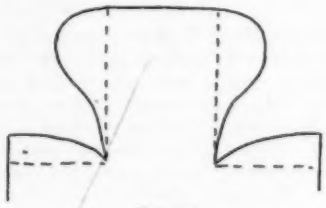


FIG. 10.

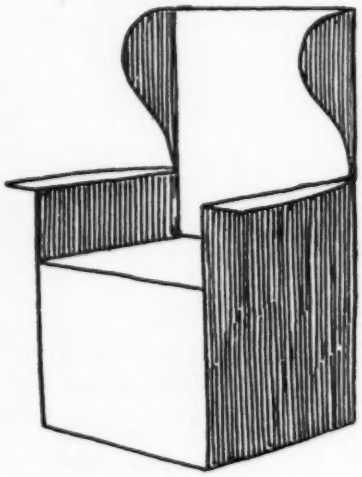


FIG. 11.

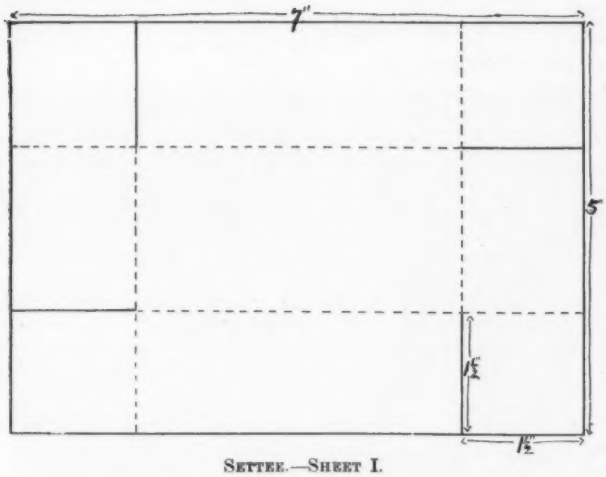
SETTEE.

Paper Needed.

Sheet I. A rectangle 7 × 5 in.
Sheet II. A rectangle 8 × 4 in.

Instructions for Working.

Sheet I.—At each corner mark out a square of 1½ in. Join these by dotted lines, as in diagram, making firm



SETTEE.—SHEET I.

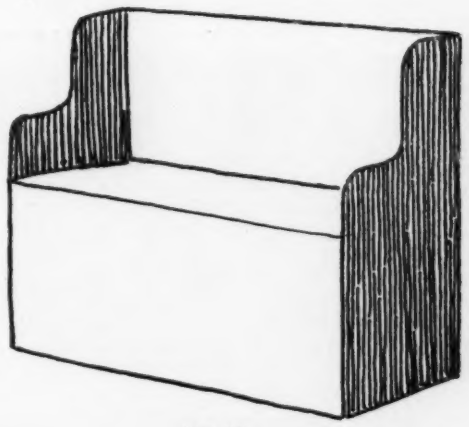
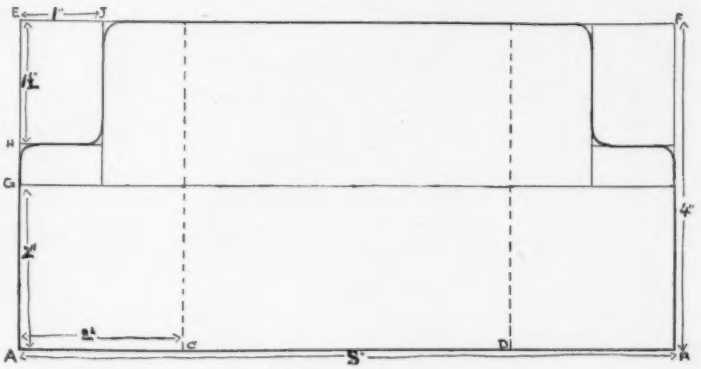


FIG. 12.

the lines indicated. Cut on firm, fold on dotted lines, and paste up to form rectangular block for seat.

Sheet II.—From points A and B on line AB mark off C 2 in. from A, and D 2 in. from B. From C and D draw dotted lines parallel to line AE. From A on line AE mark off G 2 in. from A. From this point draw a light line parallel to AB. This line fixes the position of the upper edge of the seat. From E on line AE mark off H 1½ in. from E. From E on line EF mark off J 1 in. from E. From J draw a light line parallel to EG. From H draw a light line parallel to EJ. Draw free-hand curves as in diagram to complete arm of settee, and proceed in the same manner on the other side at corner F. Cut away the corners at E and F, and fold on dotted lines from C and D. Paste to back and sides of seat, as shown in sketch (Fig. 12). The form of the sides of the settee may be varied, as in the armchair (see Figs. 8–11).



SETTEE.—SHEET II.

PRACTICAL INSTRUCTION NECESSARY.

INSTEAD of answering the question with a "yes" or a "no," let me mention a somewhat interesting fact. The headmasters of the great public schools of England—the best secondary schools for boys in the world—have been consulting together in order to decide what subjects ought to be compulsory in those great schools; and they have decided in committee that manual instruction and music, along with some other subjects, ought to be compulsory. That manual training should be regarded as essential in schools where Latin and Greek have been regarded for centuries as the only true means of education, is indeed a notable event.

INTELLECTUAL STUDY NOT ENOUGH.

What does this imply for us? It means that at last even the most conservative type of teachers—(and the late Professor Blackie used to say that there was no class of men so unteachable as schoolmasters)—even they have come to admit that mere intellectual study is not enough to educate, and that to the young human being practical work has a unique educative value. And you must further remember that the boys in those public schools are never likely to do a single day's work with their hands in after life. The value of the training to them does not depend upon the practical skill which they will acquire. It depends wholly upon the purely educative result—the training of the will which comes from the power to control the muscles; the sense of power, and the development of personal initiative; the training in accuracy; the feeling of cause and effect as active in the world; the development of brain-centres which study does nothing to develop; the moral training which comes from the giving out of effort instead of the taking in of impressions and ideas; the whole sphere of educative influences that arise from the orderly doing of things, and making of things—a sphere by far too wide for me to discuss fully here.

By practical work, then, we reach a type of education which we can never attain by mere instruction. By manual training we shall produce a type of boy who shall be of more real use in the world than the mere student of literature and science can ever be—more alert in action, more intelligent in seeing the connection between things, more accurate in listening and in doing, more efficient in every way as a member of society.—*Dr. John Gunn: "Some Aspects of Girls' Education."*

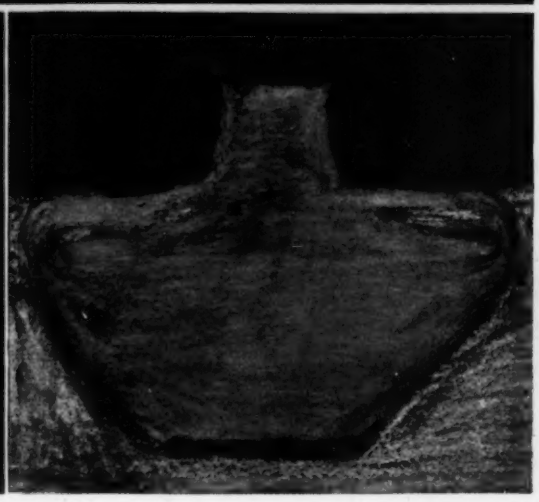
COLOUR WORK IN SCHOOL.

DRAWING WITH CRAYONS.—II.

BY J. YOUNG, GLASGOW HIGH SCHOOL.

IN answer to the request of one or two of my correspondents I have prepared a page of examples and a few notes, which deal with crayon work more particularly from the pupil's point of view. The pupil's difficulty is often different from the teacher's difficulty, and it was the latter which chiefly concerned me in the former article. On the coloured plate I have arranged a few examples illustrating directly four steps in the making of a crayon drawing, and two contrasting samples taken from the work of the same class, to show good work and bad work—what to look for and encourage, and what must be avoided at all costs. In the first row are a few examples of outline. Though the crayon is a medium which admits of doing drawing, painting, and shading all in one operation, still it would be unwise, with young children, to begin the shading of any study without first planning out the composition and sketching at least the general outlines of the objects forming the group. At the same time the outlining of details can be very much overdone; one must be prepared to lose and regain lines of the drawing as the work proceeds. The principal forms, however, ought to be sufficient for the first stage, and these should be sketched in direct, with the chalk nearest to the colour required, and in the light and delicate manner indicated by the first row of sketches. To do this, one must take a long hold of the chalk, gripping it lightly by the end with the thumb and two fingers. *After well considering the line to be drawn*, put it in with one sweep of the crayon. The point alone of the crayon should just bear upon the paper, with the slightest possible pressure. This operation is somewhat like that of a horse going downhill. One must bear a little to get a mark at all, but it is generally a case of "holding back" and resisting the tendency to press. If errors are made, they should be left, and let the first one be a sufficient example to guide you to the right path at the next trial. The shading which is necessary to represent the tone and colour of the surface or its background will take in all these errors. Certainly do not use rubber if you can possibly do without it, and remember that rubber *can-*

not be used with crayons in the same way and to the same extent as when drawing with pencil. In short, the drawing should be, as far as it goes, absolutely correct, and should be done with so much care and forethought that errors are not made at all. Of course, to one who has some experience in the use of the materials, errors in drawing give no trouble whatever; they are allowed for at the beginning, but are completely worked out before the drawing is finished. After outlining any object correctly, one begins to lay in the shades. As an example, the shaded drawing of the matchbox was first outlined in much the same way as the cigarette box was drawn on the left. Begin at the top of the drawing, and put in the right contrast between the upper planes of the object and its background. If the colour of the paper you are working on does not adequately represent the background of the model, it



The right way to use the chalk.

The wrong way to use the chalk.

COLOUR WORK IN SCHOOL.

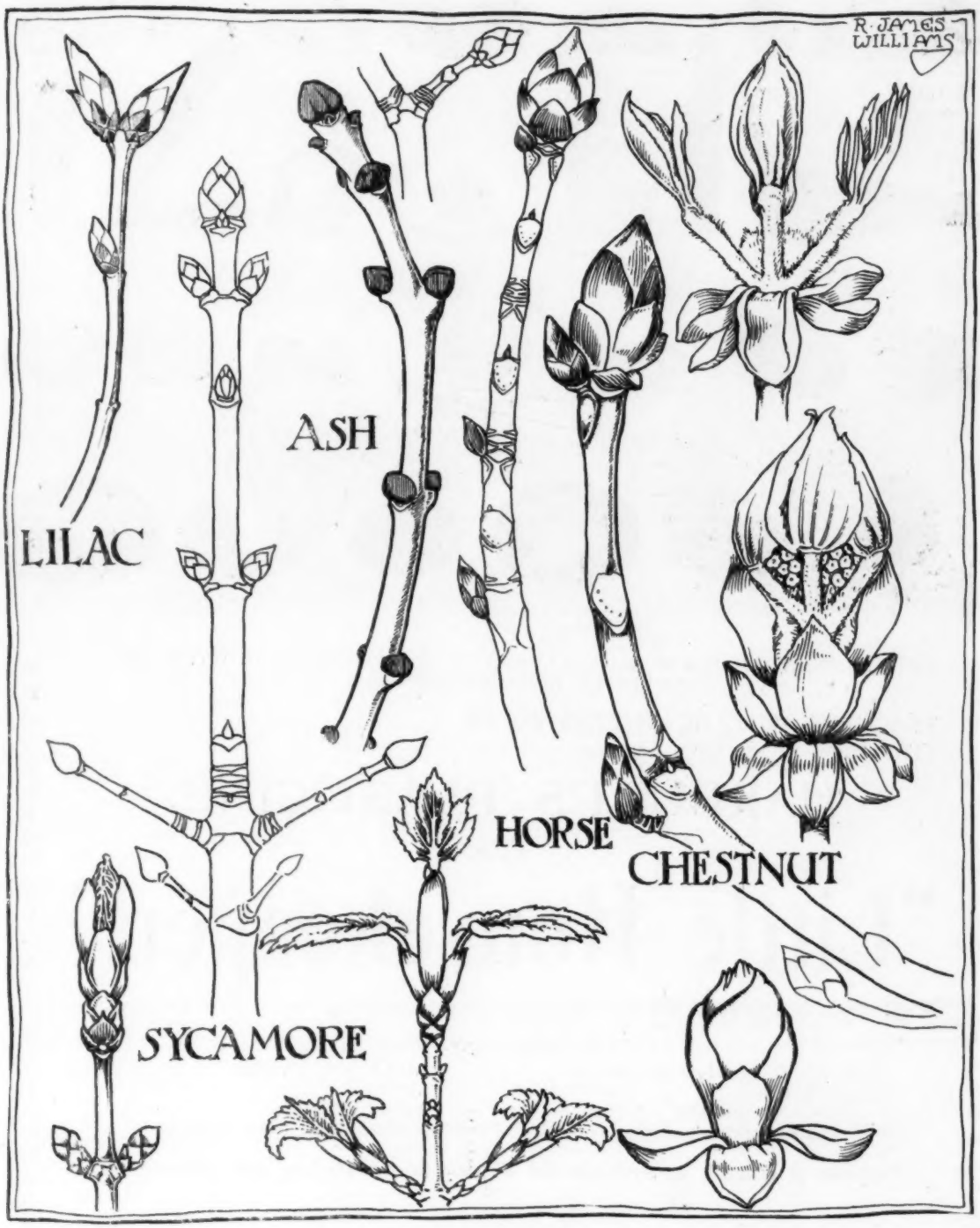
should first be shaded correctly; you can then put in the true colour of the first planes of the object with far more certainty. There is no use going on shading the object on a background which is different from the real one. All colour is relative, and the surface shading on the object can only look right when the immediate surroundings are also correct. Background and object must be carried on together; it is fatal and very misleading to do either one alone. Put in a series of parallel strokes with the required chalk or chalks, as at No. 2 top; then cross these by a second series almost, but not quite, parallel to the first. This may be done with the same chalk, or with a different colour if the tint desired is to be a blended colour. Repeat this process until the plane seems flat and of its true tone and colour. There are hundreds of exercises similar and equal to those given which a teacher can find and arrange to suit the abilities of his class. It is important to remember that we must carefully consider just how much can be reasonably expected of a pupil before the beginning of a lesson. Do not ask too much, do not expect too much; but within the limits set, exact absolute truth of statement in every respect. Plain shading should present no difficulty to the student who is trying to do his best. Once let him off with careless and slovenly work, and the teacher's difficulty with such a boy is enormously increased. Remember to be content to approach your final result in easy stages. Caution is more sound advice to both teacher and pupil than boldness. Freedom and boldness can only come with long-continued practice.

The blending of colours and the representation of roundness and space are much more difficult exercises. A pupil who is at all critical of his own work is generally dissatisfied with his efforts, because they look so flat—the reason being, of course, his lack of appreciation for the finer changes in tone and colour upon the surface of an object. In the drawing, one chalk has been used when perhaps a blending of four or five would be necessary. A much richer and often truer effect is got by blending various tints where at first one would seem quite adequate; and, if you are careful to use each chalk in the light manner indicated in the plate, it is possible to go on changing a tint to almost anything by the application of a second or third colour over the others.

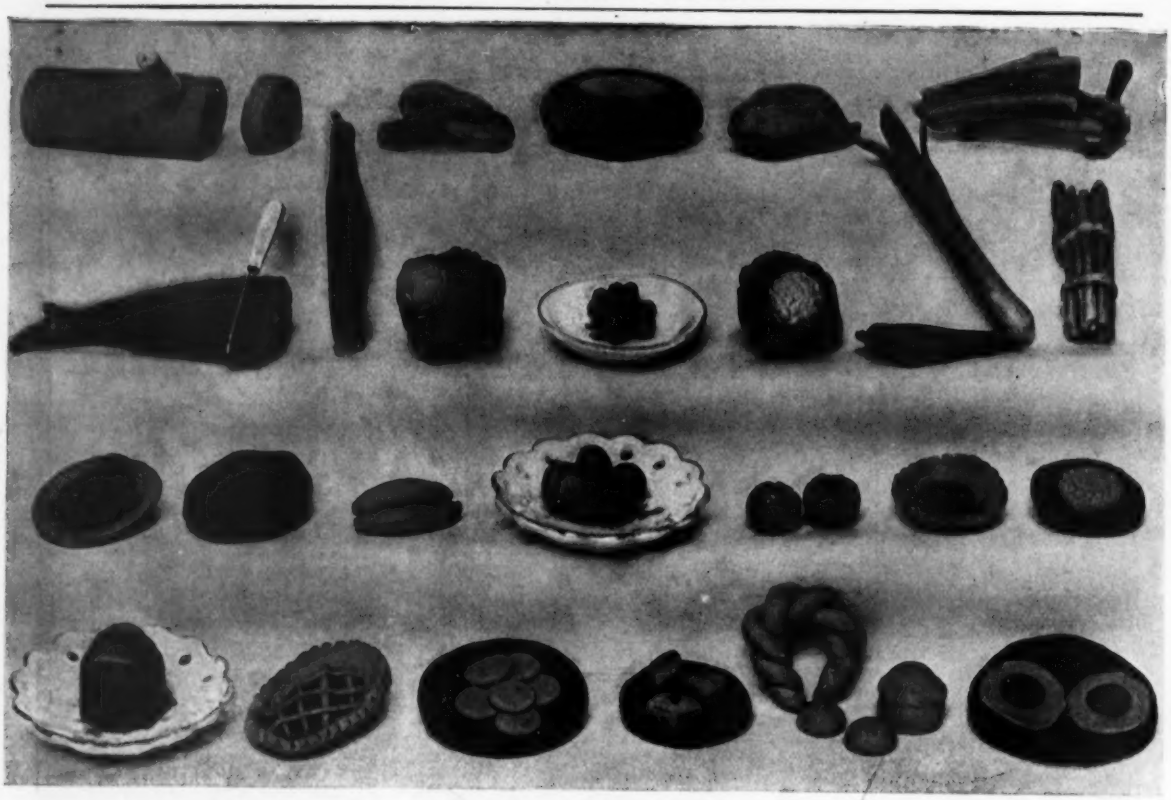
When beginning the representation of simple groups, as shown at 4, it is well to remember that though a ball of wool may be green in colour, the light falling on it may so change it in appearance that yellow, white, or dark green and black may be necessary in its representation to give the solid rounded appearance with the idea of space and surroundings. And so on with any other colour—when the object is round it requires more than the mere matching of its colour or tone to fully represent it.

And now a word or two about the two drawings at the foot of the coloured plate. The blue jar at the left was done by a boy who is good at drawing; while the yellow one on the right is the work of a newcomer in the same class, who has had no previous lessons of this kind. The boy who did the first drawing has kept everything light and delicate, yet he reaches full strength of colour and shade wherever it is necessary; while the other merely sees that his jar is yellow, selects the yellow chalk, and rubs it all over the whole space equally. Not so the pupil who did the blue jar. He sees its roundness, its light side, and its shade and shadow. He appreciates the difference between gentle gradation and sudden change, and applies his colours to the paper in the right way to secure a true and sympathetic representation of what he has observed. All of this he states in a light and delicate manner, which admits of alteration and correction; but the other commits himself at once to a shading which could not be changed, even if he had the power to appreciate the necessity for it.

The other drawings, which are unfortunately not reproduced in colour this month, merely give suggestions for the development of the lessons, with ideas of what it is best to attempt and how to grade the lessons.



SEASONAL SUGGESTIONS.



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Our Needlework Column.

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THE REPAIRING OF GARMENTS IN GIRLS' SCHOOLS.

(*Continued from page 547.*)

To Repair Holes caused by Pulling off Buttons (Fig. 1).

First Method.—If the hole affects only *one* thickness of the band, a square or oblong of tape, or material like the garment, hemmed round, will suffice (Fig. 2).

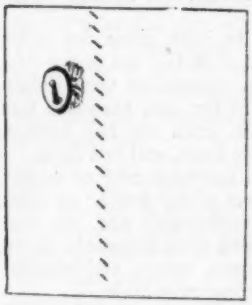

Fig. 1.—Hole caused by Pulling off Button.

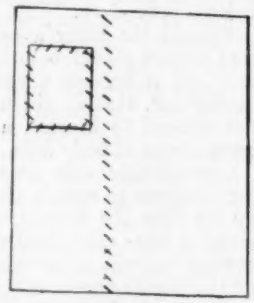

Fig. 2.

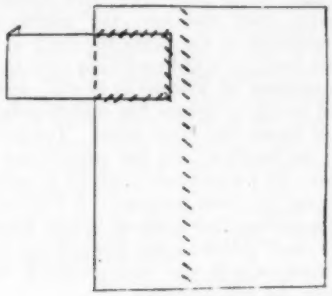

Fig. 3.—Right Side.

Second Method.—This may be applied when the hole occurs near the end of a band through *both* thicknesses. Take a strip of firm tape long enough to cover one side of the hole, and to turn over and cover the under side, with a little additional length for turnings. Turn in one end of the tape, and tack it over the hole on the right side. Hem with fine cotton (Fig. 3). Turn the tape over, and complete on the under side (Fig. 4).

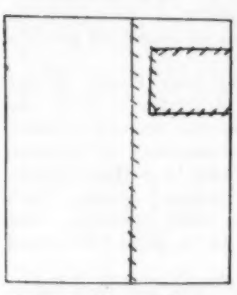

Fig. 4.—Wrong Side.

Fig. 5.—Tape inserted into the Hole.

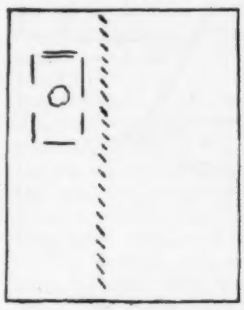

Fig. 6.

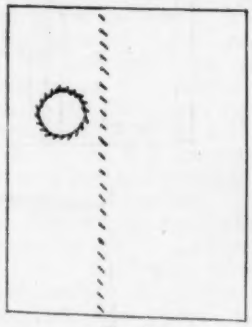

Fig. 7.

Third Method.—This is the most difficult for young children, but older ones will be able to manage it. It is rather neater than the others. Squeeze a small square of good tape through the hole (Fig. 5). Lay it flat, in the proper position, between the two thicknesses of the band, and tack it in place (Fig. 6). With the point of the needle turn in the ragged edges of the hole, on both sides if needs be, and hem round neatly (Fig. 7). Sew the button to the tape.

Mending a Torn Buttonhole (Fig. 1).

First Method.—Take a piece of firm tape, a little wider and an inch longer than the hole. Make a narrow fold at each end of the tape. Tack it on the *wrong* side of the garment under the buttonhole, and hem it neatly (Fig. 2). Cut the hole in the tape, and work it with buttonhole stitches, covering also the original stitches.

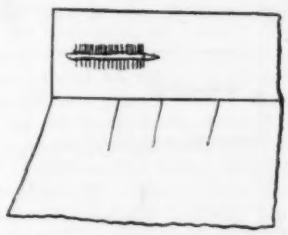

Fig. 1.—Torn Buttonhole.

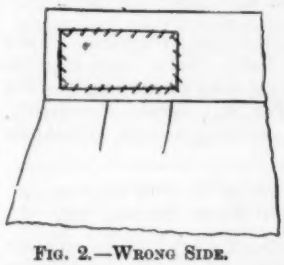

Fig. 2.—Wrong Side.

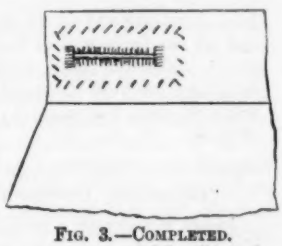

Fig. 3.—Completed.

It may be rather thick, but it will be strong (Fig. 3). Probably both ends of the buttonhole will be so torn

as to need bracing with strands of cotton before buttonholing them.

Second Method.—Adopt the same plan, where practicable, as is described under the second method of dealing with a hole caused by tearing off a button. Then cut and work the buttonhole.

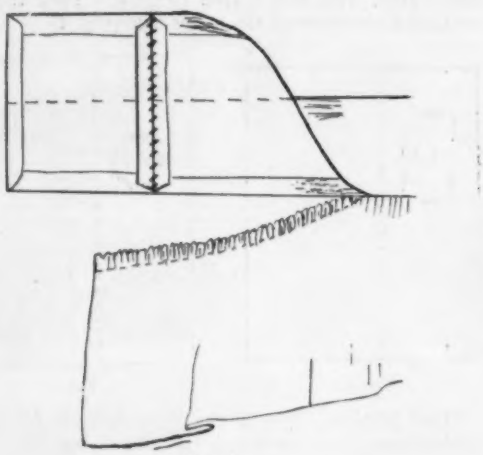

Fig. 4.

Third Method.—A neater way is to unpick part of the band from the garment. Take out the stitches of the old buttonhole. Open out the band. Tack a strip of tape on the *inside* of the *back* fold of the band.

Sew on the band, and work a new buttonhole.

Fourth Method.—This is specially applicable to holes at the *end* of a band, such as an apron or similar article. Cut off the end of the band just beyond the hole.

Undo enough of the seam or gathers to allow the band to lie open and flat. Procure a strip of similar material, selvedge way, the same width, but a little longer (to allow for turnings) than the cut-off end. Make a narrow

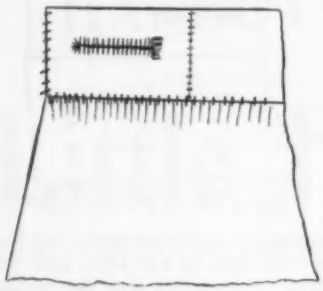

Fig. 5.

fold along one end of the strip on the wrong side. Make one on the loose end of the band. Seam these together firmly inside the band, making the commencing and the fastening-off very strong (Fig. 4). Stroke thoroughly, and complete the band by working a fresh buttonhole (Fig. 5).

To Repair the Frayed Edges at the Bottom of Pinafores, Cotton and Print Skirts, etc.

Insert scissors or a penknife at some hole, to separate the two parts along the frayed edges without undoing the hem. Cut off the raw edges. Turn up each loose edge about half an inch more or less, according to the thickness of the material and the depth of the worn part. Tack the edges together and slip-stitch, feather-stitch, or stitch by machine. This slightly reduces the length of the garment, but it makes a firm, neat hem. If there be a tuck, it may be let down to give extra length.

THE USE OF THE SEWING-MACHINE IN SCHOOL.

THE word "spinster" owes its origin to an unwritten law in Anglo-Saxon times, which was to the effect that no woman should be allowed to marry until she had "spun" a complete set of household linen. It was the duty of the women of the home to spin into yarn the fleece brought home in summer time, and then to weave it into coarse cloth.

Edward the Elder appears to have given the order that women should be instructed in the use of the distaff. So it became a custom, sometimes very rigidly carried out, that no girl was fit for, and therefore was not allowed to become, a wife, until she had spun a complete set of body linen, table linen, and bed linen.

Consequently, each prudent, farseeing mother taught her daughter to spin in the days of her youth; so that, by the time she became of marriageable age, she possessed a large chest, well stocked with household linen, sweetly fragrant of lavender, spun, woven, and stitched by the nimble fingers of the prospective bride.

No doubt this was the origin of the "bottom drawer" of modern times, where girls store their handiwork against the day when they will have homes of their own. Probably that was also the beginning of the custom of relegating to the bride the duty of providing the household linen, in addition to her own trousseau.

In some countries of Europe it is still customary to require a girl to show, before her wedding-day, a complete stock of house and body linen. The practice is a common one in Sweden, and the mayor can refuse to allow a maiden to be married until he is satisfied that she is competent in these matters. A Swedish serving-maid once showed me her store of strong brown twilled calico sheets and pillow-cases, beautifully inset with Hardanger work, which she had prepared, in her few spare moments, for her marriage.

In these advanced days, when sheets, pillow-cases, table-cloths, etc., can be bought stitched and marked ready for use, it is no longer considered quite the fashion for the wife to provide these things, and the husband is expected to purchase them. But many brides still prefer to help towards the furnishing of their home by taking with them as large a stock of household plenishings as they can gather together.

At the present time, the only place known to the writer where handwoven linen is produced is in the neighbourhood of Keswick, where the revived industry owes its resuscitation to the endeavours of Ruskin. Beautiful artistic linens are woven in cottage homes, from flax grown in Ireland and dyed in Scotland. Such exquisite handwork is put into these materials, that five pounds is no unusual sum to be given for a small overall for a young child.

Power-looms gradually transferred the making of linen from the cottage to the mill, and the spinning-jenny became, what it is now, a curiosity.

Handwoven materials are entirely replaced by machine-made goods, which, though more regular, and probably finer in texture, lose in durability what they make up in

appearance. The *look* of a thing nowadays is of more account than its wearing qualities.

Long after machinery superseded hand-looms, it still remained the pride of mothers and daughters that all contributions to the new home should be hand made, which by that time simply meant hand *sewn*.

With the advent of the sewing-machine the first blow was struck at hand-sewn garments; and although the sewing-machine is a "boon and a blessing" to thousands of thrifty housewives, yet it is still a delight to handle dainty garments into which every stitch has been worked by hand.

In convents, where girls are allowed much less liberty than their Protestant sisters, the cult of the needle still flourishes, and marvellous garments are produced, decorated with hundreds of "pin" tucks, to the probable detriment of the eyes of the workers. Still, it is to be hoped that the day will never dawn when in England girls and women cease to love needlework, not only for its own sake, but for the effect it has upon the worker. It quietens the nerves, and gives such opportunities for planning and arranging as cannot take place to the accompanying whir of the sewing-machine.

Then, too, we naturally place most value on that which costs much, and when we have devoted days to the making of one garment, or paid the high price of a hand-sewn one, we bestow more care on its wear, and treat it generally with more respect than one which has been put together at a sitting, or bought very cheaply. Certain it is, if we bestow a large amount of labour upon an article, it becomes essential to procure the best material that we can afford, that our labour may not be in vain. When, however, all is said that can be said for hand-sewn work, there still remains the fact that life in all its phases is different from that of fifty years ago.

Fewer women look upon matrimony as the be-all and end-all of existence, and the duties and claims of a wider and fuller life leave less time to be devoted to sedentary pursuits. Women have learnt also to place a higher value on their health. As wage-earners they now realise that "a sound mind in a sound body" is their most valuable asset; and it is now no longer the fashion, as in the early Victorian days, to look "delicate," and to faint with the least exertion.

(To be continued.)

Note.—Many correspondents have written me privately for information respecting needlework, and with the Editor's kind permission I will answer in this column any question of general interest—addressed to the Editor. It often happens that what is a difficulty to one person is also a difficulty to another, so that help given to one will, I hope, be help rendered to many.

The name and address of correspondents should be given, and a *nom de plume* for replies.

MODERN EXPERT OPINION ON THE TEACHING OF NEEDLEWORK.

THE Froebel Society held a discussion at the College of Preceptors on Tuesday, March 1, on the teaching of needlework, for which a large audience of teachers assembled, late-comers not being able to obtain seats. The chair was taken by Miss E. R. Murray, head of the kindergarten training department, Maria Grey College (in the absence of Mr. Frederick Rose, Ph.D., London County Council). Short papers were read by Miss Brown Smith, Mistress of Method at the Goldsmith College, New Cross; Miss C. R. Gordon, L.C.C. organiser of Domestic Economy; and Miss K. H. Buck, Needlework Mistress, Northern Polytechnic Training School of Domestic Subjects.

In her paper on "Early Needlework as an Educational Subject," Miss Brown Smith dealt with the teaching of needlework to children below the age of eight. She distinguished between the *industrial* and the *educative* value of needlework. Its industrial value was much affected now by the universal use of the machine; but as a branch of educational handwork it stood high. She read extracts from Professor John Dewey's "School and the Child," in which he points out that machinery has not done away with the *human* part of the subject—the initiative required in planning and mending. Expertness is not to be altogether neglected, but it is the last thing to be considered in teaching the subject to children.

Miss Gordon read a paper on "Needlework during School Time." She dealt very carefully with the teaching of needlework to girls over eight years of age. Her remarks about mending were of special value. She urged that, in her opinion, while the encouragement of a habit of neatness was most valuable, things should not be mended unless they were worth the time to be spent upon them.

Miss Buck's paper on "Needlework Training for Teachers" dealt with the training of specialists—with the teaching of needlework to young women who were afterwards to become needlework teachers. She explained that the use of the machine had not done away with the need for dexterity by hand, and said that in her experience the good hand-sewer made a good and neat machinist.

Dr. A. R. Abelson then dealt with the subject from the hygienic standpoint, and alluded to the new suggestions on the teaching of needlework issued by the Board of Education. He referred especially to the points that the instruction of weakly children should be done with care, and that some should be exempted altogether. Care should be taken of children's sight. He reminded his hearers that children below the age of six cannot be taught needlework without risk. He said that, in his opinion, the medical officer should find out which of the children are unfit: such children cannot be taught needlework without injury not only to their sight but to their general health. He reminded his hearers that in Miss Margaret M'Millan's pamphlet, "New Life in Our Schools," she says: "You can teach sewing or writing to children with distressing eye troubles, and earn splendid grants thereby; but all this is not real education, but a very bad substitute for it." He urged that teachers should be allowed a freedom which they do not at present possess—namely, to abstain from teaching needlework altogether at times when the light is bad.

The number of teachers who asked questions afterwards proved the interest with which the different papers had been heard; and a vote of thanks, proposed by Dr. Abelson, concluded a very successful evening.

Lady teachers interested in the subject will be able to read the various papers in full in future numbers of *Child Life*, the magazine published for the Froebel Society, 4 Bloomsbury Square, W.C. Next month's issue of the *Practical Teacher* will contain a paper by a medical man on children's eyesight.

The "Unlessoned Girl."

"What shall I say of the 'unlessoned girl,' who appears among the helplessness, the blindness, and the vindictive passions of men, as a gentle angel, to save merely by her presence, and defeat the worst intensities of crime by her smile?"—JOHN RUSKIN.

MISS AMY BRANDON THOMAS, the "Portia" in Mr. Arthur Phillips's revival of *The Merchant of Venice* at the Court Theatre, might have taken her interpretation of the character from the above lines from *Sesame and Lilies*. I am conscious that this is a very high tribute, but it is a reasoned opinion based upon careful observation. And if I were a fairy godmother, I would transport to the above-named theatre every "quality of mercy," bravely delivered, I caught myself wondering whether it is a good thing to make such lines as these familiar to children with that familiarity which breeds, if not contempt, at least indifference. How we should rave journalistically if some poet of the present day produced a play with one-tenth of the quality of this comedy, which is so readily passed over for the latest Gaiety frivolity.

A SCENE FROM MR. ARTHUR PHILLIPS'S REVIVAL OF THE MERCHANT OF VENICE.
Antonio (Mr. James Berry). Bassanio (Mr. Cyril Keightley). Gratiano (Mr. E. Harcourt Williams).
Portia (Miss Amy Brandon Thomas). Nerissa (Miss Dora Hole).
(Daily Mirror Copyright.)

boy and girl who has been called upon to read in class Shakespeare's immortal comedy.

I used to teach it myself, so that even at this distant date I am almost word perfect in the play. But how little I made of it, and what a mistake it is to use such a production as a mere exercise in reading, or even in elocution! Shakespeare wrote it to be played, and until the pupil has seen it played he has not the faintest conception of its real meaning and its qualities. In the mimic life of the stage how graciously fall those words which seemed so trite and stale and unprofitable during the forty-five minutes allotted to "literature!"

In fact, as I listened to the beautiful speech on the

Now, there is something wrong in our educational dealings with Shakespeare. As I have already hinted, he ought not to be treated as a mere writer of school reading books. He was dramatist, actor, and stage manager from start to finish. Further, he wrote for grown-up people, and in my humble opinion his plays ought not to be used for children at all. Boys and girls can be introduced to him in several ways, such as have been indicated in these columns again and again; but the plays themselves in their entirety are for those who have had at least some experience of life. To nauseate the child with them is an injustice to Shakespeare, and the forcing of his works on the immature mind is one

THE FISHERMAN AND THE RING.
(From the painting by Paris Bordone. Copyright reproduction by Anderson, Rome.)

of the direct causes of the young man's choice of Gaiety productions, and the young woman's preference for plays which are mere fashion plate tableaux.

But I am forgetting Mr. Arthur Phillips, who makes an excellent Shylock, full of venom and tenderness, dignity and servility. It is a fine rendering of the character, somewhat too deliberate, possibly—though I am ready to acknowledge that my slight feeling of impatience at certain points was the result of my unfortunate educational experience of the comedy. Mr. James Berry's Antonio is "languidly submissive to adverse fortune" to the right degree indicated by Ruskin; while Mr. Ross Shore makes the most of Launcelot Gobbo's possibilities. How his performance would delight the school pupils who endeavour to parse and analyse his speeches! The setting of the play is a dream of old masters, and the casket scene is especially beautiful. But I was disappointed in the arrangement of the trial scene, where Bellini's Doge is packed away in a corner, and presented sideways to the audience. It is true that the stage is small, but it is surely possible to exalt the duke and his counsellors as in Bordone's picture shown above, the background of which has been reproduced, I fancy, in one of the scenes in this excellent revival. Shakespeare makes his duke more or less silent, as justice must always be; but the representative of sovereign judgment is the real centre of the scene, and the advocates ought to plead at his footstool.

CHRISTIAN NAMES.

BY RUBY K. POLKINGHORNE, B.A., L.C.C.
STOCKWELL SECONDARY SCHOOL.

(Continued from page 488.)

LATIN NAMES.

WE come now to a nation of more mingled blood, and therefore more mingled language. Their names often belonged to forgotten languages, and conveyed no signification to their owners.

Every Roman citizen had at least two names, an individual name and a family name — for example, Marcus Tullius Cicero, Caius Julius Cæsar.

Lux (light) gave the favourite individual name Lucius, from which we get our Lucy and Luke. The meaning of Marcus—our Mark—is involved in doubt. Some names were derived from places, as Hadrianus, Albinus. The Romans were fond of numerical names, such as Primus, Secundus, Tertius, Quintus, etc. They have not been copied in this by other nations, except that Nona (the ninth) is sometimes the name bestowed on a ninth daughter. The Romans were obviously not good at inventing names. The Latin surname Cæcilius, from which we get Cecilia and Cecil, is believed to mean blind. St. Cecilia's history made the name popular.

Florentius (flourishing) and Flos (flower) give us Florence and Flora. The heroism of Florence Nightingale has done much to make the former name loved. The Irish Florence or Flory, so common in Ireland, is perhaps intended for the Keltic word Fineen (fair offspring).

We owe the name Beatrice (Lat. *beatus*, blessed) to the influence of the Early Church. The original name Beatrix is said to have been borne by a Christian maiden who lived in the time of Diocletian. She drew the bodies of her martyred brothers from the Tiber, and buried them. Afterwards she shared their fate. Her relics were enshrined in a church in Rome. The story of her sisterly love and divine faith made her name famous in adjacent countries. It became much loved in Florence when Dante made Beatrix, the love of his youth, the subject of his *Vita Nuova*, and his dear guide through Paradise.

Other Latin names are Clare (*clarus*, bright), Hilary (cheerful), Lettice or Letty (*lætus*, glad), Nora (honour); but these were not used by the Romans themselves.

NAMES FROM THE KELTIC LANGUAGE.

(Ancient British, Welsh, Irish, Gaelic.)

The history of names from this language is very obscure. Many names were descriptive, and often highly romantic and poetical, as befits the Kelts.

Their individual names were entirely personal and not hereditary, but pride of ancestry caused the father's name to be added. In Wales the surnames became so unmanageable owing to the father's, grandfather's, and forefathers' names being heaped upon one head, that

in the fifteenth century they began to content themselves with one surname.

Ap in Welsh connected the person with his ancestor, as Pugh = Ap Hugh, son of Hugh. In Gaelic the word Mac (son) or Oor au (grandson) was used.

Many Keltic names, as Caswallon (chief of great hatred), Ossian, Boadicea (victory), Aidan (fire), Cymbeline (lord of the sun ?), Conn (wisdom), have fallen into disuse, partly because all Keltic countries have a practice of adopting names from their neighbours.

Guy (sense ?) was very popular until Guy Fawkes and his treason gave the name a somewhat sinister association. It has, however, probably recovered from this. Cara (friend) was sometimes prefixed to a saint's name, as Cara Michel, friend of Michel.

Bridget (Brighid, Brigh, strength) became one of the very few Keltic names of European popularity. This is owing to the fame of St. Bridget, the pupil of St. Patrick; she died in 510. Her history is worth studying. Patrick is not a Keltic name, but formed from the Latin Patricius (noble).

Angus (excellent virtue), Fergus (man's strength) are names at home in Scotland. Arthur (high ?) is, perhaps, the most renowned of all Keltic names. Gwendolen (white browed) is well known through the legends of King Arthur. Other Keltic names are Owen (lamb or young warrior ?), Winifred (white stream), Duncan (brown chief).

Teutonic Names.

(*Scandinavian, Anglo-Saxon, German.*)

Teutonic names were almost all compounds of two words, as Ernest (eagle free). The names were individual, but every child was also called the son or daughter of the father—as, the Karlingen, sons of Karl (note the *ing*). The great mass of modern European nomenclature springs from the Teutonic language—for example, Frederick (peace ruler), Frank and Frances (free), Henry (home ruler), William (helmet of resolution), Hugh (mind), Harold (warrior power), Walter (powerful warrior), Humphrey (support of peace), Arnold (eagle power), Robert (bright fame), Charles and Caroline (man), Maud (mighty battle), Alice (noble cheer), Bertha (bright), Ethel (noble), Elsie (noble cheer), Louisa (famous war), Adela (noble cheer), Edith (rich gift), Mildred (mild threatener), Ada (happy), Gertrude (spear maiden), etc.

The above account of Christian names is meant only to be suggestive. Those who want fuller histories of the names must turn to Charlotte Yonge's book, from which much of the above has been taken.

If the children have lists of names and their meanings belonging to different nations, interesting problems can be thought out by them: for example, What information do the meanings of the names give about the character of the nation? Why have we borrowed so few names from the Persians? (We have only one common one—Esther, star.) They will discover for themselves (if we give them plenty of examples) that names derived from places are almost all Latin, those of lofty Christian ideas Greek, the Keltic are the most poetical, the Greek and the Teutonic most alike in sense, and so on. Quite easily they will begin to understand the great family of languages, and how they are related one to another; quite naturally they will begin to love some of our finest words.

REFORM IN THE GEOGRAPHY SYLLABUS OF THE PRIMARY SCHOOL.

BY C. BIRCHENOUGH, THE UNIVERSITY, SHEFFIELD.

(*Continued from page 470.*)

SELF-ACTIVITY, then, is the basis of Rousseau's method. He recognised the importance of carefully-guided observational work in conjunction with the recording and expression of what had been seen. Pestalozzi attempted to apply and develop this rational method in his school at Yverdon (1805–25), and was the means of inaugurating a new movement in the teaching of geography; and it was from him that Ritter, the founder of modern geography, derived his method.

Rousseau and Pestalozzi both seem to have erred, however, in advocating a wholly synthetic as opposed to an analytic treatment of the world. The older method began with the cosmos and analysed it, relying largely on the memorising of definitions at the outset, and the learning by heart of an increasing number of facts as the pupil was brought nearer home. The reformed method of Rousseau, as developed by Pestalozzi, tended to over-emphasise the study of the home district to the neglect of the world, and required an accuracy of observation and a precision of knowledge at times not altogether in keeping with the mental capacity of junior pupils; but this was inevitable in the early stages. This "method" has entered in modified form upon a second phase under the influence of that scientific movement which has been such a marked feature of the nineteenth century.

Scientific method owes its success to the principle of induction, and Bacon early in the seventeenth century demonstrated its value. Observation, inference, experiment—these are the keys of modern scientific advance. Not that the earlier philosophers disregarded facts, but they regarded them too little. What is the natural method of the trained scientist must clearly be the method for the school pupil to learn; and so it happens that observation itself (the mere seeing and noting what has been seen) is not sufficient: inference must be added. That such a method demands a wide basis of fact, a considerable mental development, with powers of imagination and abstraction of no low order, is sometimes quite overlooked, until to-day a child in the lowest class is expected, from watching a working model of water on a sand-heap or by examining the roadside before and after a shower, to infer the denudation of the land and the whole work of rivers as they sculpture the surface of the earth. In an over-anxiety to increase, if may be, the mental energy of pupils and to encourage habits of reasoning, there is a real danger of the teacher being deceived by appearances and becoming blind to the true position, forgetting that he may unconsciously encourage habits of mind—loose reasoning, generalising on insufficient data, a tendency to "explain" everything, no matter how rashly—that are directly at variance with the whole aim of education, which, after all, is culture and a strengthening of the moral fibre. This, then, is not education, nor even instruction in its shallowest and most degraded form. Better far the old memorising of definitions, which at least calls for a rigorous effort of attention. And all this applies in equal measure to the forced attempts to introduce children too early to the study

of maps. To get the appearance of map reading is easy, but concepts of space and the power to visualise land forms do not develop nearly so early as is often imagined. On the other hand, in an effort to avoid these pitfalls there is constant need to guard against another danger—the growth of soft options—to which the over-sentimental teacher is particularly prone. In drafting a geography syllabus, then, the teacher needs to beware of the old meaningless memorising of ill-assorted information, and also of overdoing at too early an age that inductive method which, rightly used, is the motive force in all true education. Moreover, though observation (seeing and examining, and the resulting expression of what has been seen) is the natural —and, indeed, the only—basis of education, it nevertheless needs to be supplemented by the observations of others—by description, in fact—through the medium of the teacher. Throughout, not only the scope of syllabus but the methods of instruction must be determined with due regard to the varying stages of the pupil's mental growth.

The scope of the geography syllabus presents problems much more difficult than are commonly supposed, and the question, What is the aim of the primary school course in geography? is not easy to answer satisfactorily. Some would dispatch the difficulty by saying that it aims at giving pupils the power to read and to understand a map. In anything like comprehensive sense such an aim is beyond the abilities of the average boy of fourteen years of age. Moreover, the statement is too epigrammatic in form to be much help to the majority of non-expert geography teachers. Perhaps it would be sufficient to say, in the most general terms, that the course aims at giving pupils—

(*a*) Some understanding of the meaning and significance of every-day phenomena and their effects upon man and the earth;

(*b*) Some knowledge of land forms, their graphic representation, and familiarity with the commoner topographic features that are being constantly met with and referred to.

It is surely unsatisfactory for a boy to leave school without knowing something of the broad outlines of the geography of the world. To treat of Europe and the British Empire is not sufficient. Assuming, then, that all the grand divisions of the world call for treatment during the primary school course, what order must be followed? The scientific geographer, having in mind the order of increasing geographic complexity, would decide that South America should come first, followed by Africa and Australasia, then North America, and afterwards Asia and Europe (Eurasia). This order is clearly unsuited to the needs of the primary school pupil. Europe comes too late, so late that it may never be reached by the more slowly promoted children. Moreover, it is not geographic complexity so much as human interest that is the deciding factor in arranging a scheme for children. It is safe to say that both Europe and North America are far more important than South America and even Australia, though the best order to follow must be ultimately decided by experiment. If Britain is made the centre from which a child looks out on the world to study ways of travelling and modes of life in other lands, it is immaterial at the outset whether Europe or Asia or South America comes first; the ideas the children already have and local circumstances will decide.

It will be generally agreed that method in geography falls into three fairly well-marked stages, corresponding with the stages of mental growth of school pupils.—

(1.) A period of descriptive treatment and broad colouring, when the interest of children is in man in the world and his behaviour under different conditions—a period following on and accompanying the observational and nature-study work of the first school year. Geographic interest is in typical scenery, typical industries, typical cities as the home of man. During this time the geographic sense is developed, and imperceptibly the child passes to—

(2.) A second period, where the meaning and significance of a map is understood. Here the world is resurveyed with that added precision and definiteness that follows from the understanding of maps and the growth of spatial sense and of the significance of distance. Now the inter-relation of cause and effect begins to take a prominent though incidental part, preparing the way for—

(3.) A third period—really the secondary school period —where, with the development of conceptual judgment, the scientific treatment of geography begins a study of cause and effect in the distribution of phenomena and the interaction of these on the doings and the destiny of man—a stage when geography is but little removed from the natural and human sciences.

This third period hardly falls within the primary school course, but in the last year or so something of this systematic scientific treatment is needed to weave together and give bite to what has gone before, and to indicate to the pupil something of the power of geography rightly understood.

The following scheme, drawn up by an eminent authority in Cheshire, and issued some two years ago as a guide to teachers locally, seems to the present writer of particular interest, as it serves as a good illustration of what is best in the modern movement, and summarises the principles that have been urged in the course of this article. The scheme is advisedly somewhat general in form to allow ample scope for individual initiative on the part of the teacher.

TYPE SCHEME OF GEOGRAPHY IN ELEMENTARY SCHOOLS.

Standards I. and II.

(*a*) General knowledge to be gained through real observation along with nature study and object lessons.

(*b*) Stories about different races, their occupations and modes of life as picture lessons, and subjects for oral composition.

(*c*) Simple measurements of objects and areas as part of the arithmetic scheme, and the expression of such measurements as part of the drawing scheme.

Standards III. and IV.

(*a*) Local geography of a very general kind.

(*b*) The making of models and the drawing of maps from them. (For the kind of model see such books as Dexter and Garlick.)

(*c*) Simple instruction about the globe. Relation of map to globe.

(*d*) Introduction of simplified physical and political maps—for example, physical map with three colours (0 to 600′, 600′ to 1,000′, 1,000′ and above); political map only, to show England, Wales, Gaelic Scotland and Ireland, or Scandinavia, to bring out the separation between the people of the fiords and those of the eastern

slope. Gradually, by investigation of various parts of the world, to get clear notions of the natural divisions between peoples, and of the circumstances under which artificial boundaries have to be established.

(*e*) A general survey of the world, continent by continent, to bring out the main features.

Standards V., VI., and VII.

(*a*) In these standards children can habitually do more for themselves—for example, in recording temperatures, barometer readings, rainfall, directions of the winds, and the like. This may be regarded as science, and the graphical expression as arithmetic. When compared with records from other places and the deductions made, we get to geography—the classification of lands into deserts, steppes, tundras, prairies, coniferous forests, deciduous forests, etc.

(*b*) Following the acquirement of such knowledge, the world can be treated in somewhat greater detail, dwelling more particularly on the British Empire; next, the North Atlantic and the lands about it; and finally, the British Isles.

(*c*) The interpretation and use of ordnance maps of the district. Local knowledge to be amplified and connected with science, history, local industries, and trade.

A few text-books may be mentioned as seeming to fit the needs of pupils following such a scheme as the above.

For Standards III. and IV., Mr. J. H. Mackinder's *Our Own Islands* is very useful (Philips), but as yet no book in existence gives a satisfactory general survey of the world for children of this age. Much useful material will probably be gleaned from the Oxford "Elementary Geographies" (Mrs. Herbertson), though, unfortunately, in the volumes already issued the human element is not sufficiently emphasised.

For Standard V. the style of Mackinder's *Lands beyond the Channel* (Philips) is excellent. Fuller accounts of typical life and scenery might be got, when needed, from books like Herbertson's *Descriptive Geographies* and *Man and his Work* (A. and C. Black), and from Mrs. Herbertson's *Elementary Geography* (Oxford Press), to be followed later on by such a treatment as is found in Fairgrieve's *The Round World* (A. and C. Black); while Miss Reynolds's *British Isles* (A. and C. Black) might well be made the basis of a study of the home country. But in all cases these text-books need to be supplemented by the larger works, and a fuller discussion of these is outside the limits of an article of this compass.

Sufficient will have been said to indicate something of the causes that have brought about the present activity in the methods of teaching geography, and the directions in which further advance must be sought; though any attempt to follow up in detail the development of any particular movement must, in the nature of the case, be impossible in a survey of this kind.

The Teaching of Geography in Elementary Schools. By R. L. Archer, M.A.; W. J. Lewis, B.Sc.; and A. E. Chapman, B.A. (A. and C. Black.)

This volume is literally packed full of helpful hints for the teaching of a subject which is at present one of the least adequately treated in the whole curriculum. Primary teachers who are at a loss to frame a sensible scheme of work ought to study its pages with the utmost care. The humanistic side of the subject receives due prominence, but more might have been made of its connection with other branches of the curriculum.

AGRICULTURAL EDUCATION.

A SCHEME OF WORK FOR RURAL SCHOOLS.

BY W. FRANCIS RANKINE.

Cereals as Plant Studies.

IT is remarkable that the simplest and most common plant forms are the most useful from the rural teacher's point of view. In this respect the cereals are of particular interest and importance also. Too frequently they are omitted from the rural scheme of work; and even when they are introduced, it is generally in connection with a discussion of harvesting and the value of grain as a food product. Thus it is that the early development of these plants is often overlooked; and yet a patient study of the fields when they are green with the ribbon-like leaves of the seedlings will reveal more interesting facts concerning plant development than when they are yellow with ripening grain.

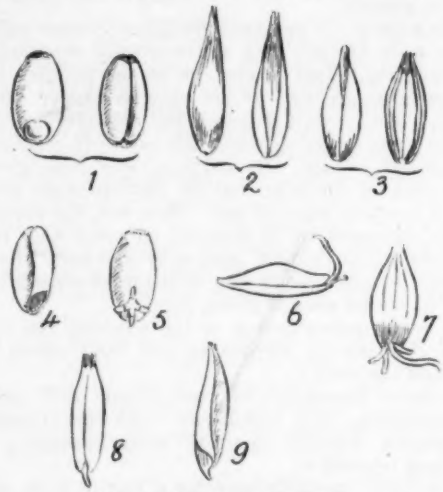

Fig. 1.—Seeds of Cereals.

1, Wheat; 2, Oats; 3, Barley; 4, section of wheat grain showing embryo (shaded); 5, wheat grain germinating; 6, 7, barley germinating (two phases); 8, oat germinating; 9, section of oat showing embryo (shaded).

Wheat as a type of the cereals—which, by the way, belong to the grasses—has already received attention in these pages. In one direction the cereals lead to the discussion of food production on the farm, and in another they introduce the country child to the study of the most important grasses—both pasture grasses and weed grasses. Botanically their life histories are identical, and a knowledge of one is particularly useful in the investigation of the other.

1. The Chief Characters of the Grasses.

The chief characters of the grasses may be summarised as follows, and in class work these points should be elicited by directed observation of a number of complete plants.

(*a*) Roots, fibrous and adventitious. (*b*) Stems, tubular, and provided with solid nodes at intervals; the sections between the nodes are the internodes. (*c*) Leaves, alternate, parallel-veined, and provided with leaf sheaths and ligules, or tongues. (*d*) Flower, a spikelet with glumes and two feathery stigmas. (The

study of the inflorescence may well be left until June or July, when the discussion of the pollination of the hay grasses will arise.)

Particular notice should be taken of the stem or *culm* (Latin, *culmus*, a stem; compare with *haulm*,

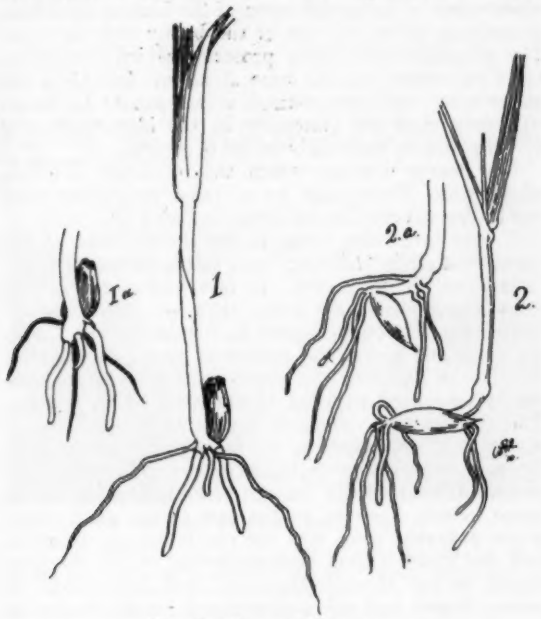

FIG. 2.—CEREAL SEEDLINGS.

1. Wheat seedling: 1a, root system. Note roots (white) developed in nitrate solution.
2. Barley seedling: 2a, glumes removed from seed to show root development.

which in some country districts is used to designate the stems of peas and potatoes.) The stem is so constructed that a combination of strength, elasticity, and lightness is secured. Thus it is that well-developed grasses are enabled to stand against wind unless it be too severe. It will be seen that it is hollow, with solid nodes at intervals. Really, it consists of a pipe of rods. Sections both longitudinal and transverse should be made and sketched, and if possible a section of a bamboo stem should be secured for comparison.

2. THE CHIEF CEREALS.

The cereals commonly cultivated in this country comprise wheat, barley, oats, and rye. Wheat, barley, and oats are grown for grain and straw, while rye is principally cultivated as a green crop. Although resembling one another very closely, and exhibiting many features common to the family of cereals, each of these plants differs individually in some respects from the other. The determination of these differences provides the pupil with a very useful exercise in observation, yet one which may be performed fairly easily if several good specimen plants of each kind be carefully compared. With respect to cultivation and soil they differ also. Thus wheat thrives best in a rich clayey loam, which should be deeply cultivated; rye and barley like light soils; while oats flourish on the cool uplands.

The most interesting period of the life-history of the cereal deals with its early stages of development. These are of such commonplace occurrence that probably their interest is somewhat discounted; precise observation will result, however, in much profitable and entertaining knowledge. This observation may be made in the field, but naturally it will be more practicable to have the material nearer to the school, and hence a small portion of the school garden should be reserved for the cultivation of a few plants of each kind of grain. In the classroom itself, specimen plants should be developed in culture solutions. These latter are particularly useful in that they render visible the development of the roots, which in the field and garden is not apparent.

(*a*) *Cereal Seeds and their Development.*—Obtain some clean samples of seeds. These should be very carefully examined with a lens, and their chief characters compared and noted. Measurements of the lengths of the seeds should be recorded. Dissect the seeds in order to reveal the embryo of each. Transfer a few selected seeds to a saucer containing moistened blotting-paper; keep them fairly warm in order to hasten germination. Evidence of germination is apparent in a day or two. As will be noticed, the mode of emergence of the radicle differs with each kind of seed. Enlarged drawings illustrative of this stage should be made.

(*b*) *Roots. Seed Roots and Crown Roots.*—Obtain a few seedlings from the farm, and if possible secure specimens of spring-sown and autumn-planted corn. Transfer the plants to test tubes filled with water, in which a crystal of nitrate of soda has been dissolved. If desired, culture solutions may be prepared, yet for ordinary work the nitrate solution is sufficient.

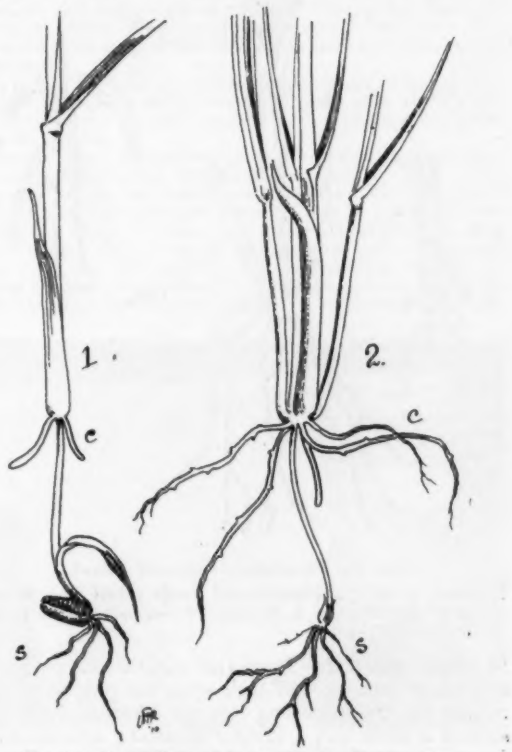

FIG. 3.—SEED ROOTS (*s*) AND CROWN ROOTS (*c*).

1. Wheat seedling (second phase). Note crown roots developing from thickened basal node.
2. Rye plant. Note tillers (see Fig. 4).

It will be seen that the first result of germination is a set of tiny roots. Generally, wheat develops three

roots, rye develops four, and barley five or six. These may be called the seed roots. While these are developing the plumule steadily rises, and in the course of time the lowest node begins to swell, and from this joint another set of roots develops. These are much more robust in character than the seed roots, and may be called the crown roots. They are usually referred to as the "coronal" roots. The gradual elaboration of the crown roots is one of the most fascinating stages in the early history of the cereal plant, and all the stages of their development may be watched in the water solution. If, in sowing in the fields, the seed is placed near the surface, the growth of the crown roots is not encouraged.

(c) *The Stem and Leaf System.*—The first green leaf is seen to emerge from a leaf sheath, which splits in order

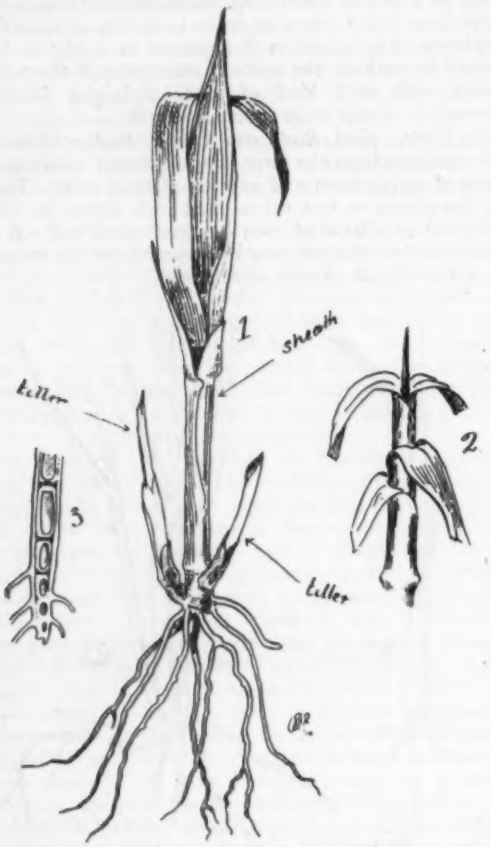

FIG. 4.—TILLERING OF BARLEY PLANT.

1. Barley plant. 2. Sheaths and leaves rolled back to show new leaf forming. 3. Section of lower part of stem to show undeveloped nodes.

to release the leaf. These leaf sheaths are characteristic of the grasses, and they serve the purpose of protecting the tender young leaves. The leaf itself consists of a blade and a tubular sheathing attachment to the stem. At the junction of the blade with the attachment, and close to the stem, is the ligule. This will be found to be modified in the various species of the cereals, and also the true grasses. It may be that its function is to prevent rain from entering between the leaf attachment and the stem. In each type of cereal the length and width of the leaf blade differs considerably; the variation in width is due to a fluctuation in the number of veins. In a barley leaf blade there may be as many as twenty of these, while in a wheat blade the number may fall to ten. Another interesting point for observation is the modification of the base of the blade. Sometimes, as in the case of the barley leaf, there are two prominent projecting processes, which almost enclose the stem; on the base of an oat leaf these are never seen. A table of these points should be drawn up, since they aid materially in the identification of cereal plants in their early stages of growth.

New leaves develop within the protective envelope of sheaths. These may be revealed by rolling back the leaves and sheaths, as shown in Fig. 4.

A very interesting stage in the development of the cereal seedling is "*tillering*," and this is particularly well exemplified in rye plants. In fact, this cereal and its grass types tiller more freely than any other species. Tillering is sometimes known as "*breaking*," or "*stooling out*," and means the growth of young shoots from the base of the stem of a plant. The term is etymologically connected with the Saxon word *telgar*, a plant. This development, which is illustrated in Fig. 4, is of the greatest importance to the farmer who grows grasses for pastures and cereals, such as rye, for fodder purposes. Tillering leads to the development of many stems, which, however, in the case of the grain crops, is not desirable, since then the plants become crowded, and the straw suffers accordingly in value. Sections should be cut through the stem, and basal nodes of young plants and the rudimentary lateral shoots or tillers noticed. These are found above the crown roots, and just below the soil surface. The rye grasses themselves (especially perennial rye grass) will yield many good examples of tillering, and at the same time explain why such grasses form a close pasture. The free tillering of these grasses renders them invaluable to the farmer for grass lands.

Longitudinal sections of the stem will also reveal the undeveloped nodes. Such a section is shown in Fig. 4, and it will be seen that the adventitious roots break out from nodes. As the stem develops, growth takes place rapidly; and if measurements are made continuously of a growing plant, it will be found that the internodes lengthen very rapidly at a certain period, and this extension usually occurs at the end of June in the southern counties, and a week or two later in the north. Prior to this period the removal of the leaves and sheaths will reveal the ear.

BLACKIE'S JUNIOR LIBRARY.—*Stories from Grimm; Tales of an Old Yew Tree; Knights of Charlemagne; King Arthur and His Knights.* (*Blackie and Son, Limited.*)

We have received the above four volumes of a new series for recreative reading, planned for those younger children who have up to the present been sadly neglected by the publishers of the numerous libraries for "school and home." These books are excellently produced in every respect. The type is large, and the setting is tasteful. The pictures are good reproductions in colour, eight to each volume. The binding is good and serviceable. The price is eightpence per volume. As for the contents, the above titles will show how suitable the books must prove for younger children, who, above all other things, love a tale well told.

PRACTICAL NOTES ON SCHOOL GARDENING FOR APRIL.

BY BRUCE COOK, CHINGFORD.

MARCH and April are perhaps the two busiest months of the year in a school garden, and the work to be done overlaps considerably, as so much depends upon the weather.

Should it be a wet March, it is better to postpone much of the work generally done on that month until a fine dry day or two in early April. To dig ground when it is wet, especially if the soil is a clayey one, is a great mistake. A golden rule is to keep off the land when the surface soil adheres to the bottom of the boots. Good fine friable dry surface soil is a *sine qud non* for successful seed sowing.

BEFORE PRUNING BUSH ROSE.

Get the lads to make up a small hot bed for raising ridge cucumbers, vegetable marrows, celery, cauliflowers, asters, stocks, etc. If you do not possess a frame, procure a few stout boxes about nine inches in depth. In many cases the boys will obtain them themselves. With a red-hot poker make plenty of holes in the bottom, and cover the bottom with a layer of cinders for drainage. On this place about an inch of well-rotted manure, and press this lightly down. Then fill up with good soil to within three inches of the top. Sow your seeds very thinly, water through a fine rose, and cover with sifted soil. Place a sheet of glass on the top of the box, obtain a couple of loads of fresh horse manure, and tread this down and place the boxes on top. Good results can also be obtained without the manure if the boxes are placed in a warm sunny spot. Examine daily, and water when required.

Rules for school gardening to be hung up in the tool-shed, and copied into the garden notebook :—

1. Never dig the ground when it is wet and sticky.
2. A place for everything, and put everything in its place.
3. Enter all work done, and specimens found, and questions you want to ask, in your notebook.
4. Note distances between the various crops.
5. Never grow plants too closely together, but thin them as soon as possible.
6. Never grow the same crop on the same ground for two seasons in succession.
7. Learn to tell the names of flowers, fruits, trees, etc., and also those of weeds, and label all seeds as sown.
8. Keep all tools clean, and, if possible, bright.
9. Aim at your plot being the neatest and crops the best.
10. Do not borrow tools, but use your own.
11. Report at once if any tool is broken or missing.
12. Help your teacher and classmates at all times.

VEGETABLE CULTURE.

Turnip-rooted Beet may b sown the third week in April, in drills 15 inches apart, and ¾ of an inch in depth. As soon as possible thin to 9 inches apart between each plant. Turnip-rooted beet does better in a shallow soil, and is ready for use much earlier than the carrot-shaped varieties.

Turnips should be sown in drills about 16 inches apart and 2 inches in depth. Nearly fill the drill with finely sifted wood ashes, after a little guano has been mixed with the ashes. Then sow the seed and cover lightly with fine soil. The reason for sowing as above is to give the plant a rapid strong growth. Strong, sturdy plants are best able to resist the attacks of the turnip fly. Turnips require plenty of water throughout their growth.

Celery trenches may be dug out. Level the soil between the trenches, and sow lettuce, turnip, or radish seeds thereon. These will be pulled before the celery (which will be planted in the trenches later) requires earthing up.

Radishes should be sown in each plot. French Breakfast is a good tender variety, and is of medium size. Mixed Turnip radish is preferred by some. Both are suitable for shallow soils. Radishes require an abundance of water throughout their growth. After sowing, protect by black cotton from birds, which are very partial to radish seed as it germinates. Radishes may be grown in rows or broadcast in beds, but they are easier to water and weed if grown in rows.

To grow well-flavoured crisp radishes, you must grow them quickly. Except in damp, rainy weather they require watering almost daily. Pull the biggest when ready, as this gives the others more room to swell.

Main Crop Peas should be sown. They take about sixteen weeks from the date of sowing until they are ready for picking. Good varieties are Duke of Albany, a wrinkled variety five feet in height, and Prince of Wales, also a wrinkled variety, three feet in height. All peas, especially the Main Crop and late varieties, delight in a deep rich soil. The distance between the rows varies with the height of the variety grown.

We advocate digging out a trench 9 inches or so in depth, and placing a layer of well-rolled manure therein. After treading this firmly, the trench is filled up with soil to within 3 inches of the top. Before sowing, all peas should be soaked for about an hour in paraffin, and dusted with red lead or soot. After sowing, cover with 2 inches of fine soil. Be careful not to sow the seed too thickly. From one to two inches between each seed is quite thick enough. After sowing, keep a sharp lookout for the sparrows, who delight in nipping off the young growth. The best way to protect the young plants is to cover the row with pea guards. Failing these, dust the rows over with soot, which also helps to keep the slugs away. Rows of black cotton, stretched along about 2 inches from the ground and 3 inches apart over the rows, keep the birds in check. When the plants are 3 or 4 inches in height, earth the rows up well, and proceed to stake the peas. The teacher should sharpen the points of the sticks, and explain the operation of staking with the boys looking on, while he performs the operation in one plot. The boys should then prepare their own sticks, and follow the example of the teacher.

All peas suffer from dry weather, and require plenty of root moisture throughout their growth. A good plan in very dry weather is to scatter short manure close up to the rows, which keeps the soil moist.

Parsnips should be sown in February and March, yet we have obtained splendid crops from seed sown early in April. Parsnips should be grown in every school garden. They are one of the most profitable vegetable crops that can be grown, and are held in high esteem by most housewives. It delights in a light deep soil, but will do well in any well-prepared soil. The ground should have been well and deeply dug in the late autumn. If possible the land should have been trenched, and left during the winter months. Sow the seed in rows 18 inches apart, and half

AFTER PRUNING BUSH ROSE.

an inch in depth. Take a handful of seed and drop two or three seeds at a time 9 inches apart, in the rows, or drills, and cover. When the seedlings are well above the ground, thin out, and keep the weeds down. They should be ready for digging in November. Some lift the whole of the crop and clamp them, opening the clamp as required ; but, from experience, we advise

leaving them in the ground, and covering them with some litter or sifted ashes to the depth of 3 inches. This is a splendid protection against the frost. They may then be dug as required.

Carrots can be sown the third or fourth week in April in drills 12 inches apart. Cover with very light soil. Soot may be lightly dusted over the drill. Should the soil be shallow, grow

BEFORE PRUNING STANDARD ROSE TREE.
(From a photograph; copyright of the author.)

a stump-rooted variety; but in deep light soils, long Red Surrey or Altringham varieties are recommended.

Potatoes of both the early and late varieties may be planted early in April, especially if the seed potatoes have been sprouted in boxes beforehand. The early varieties should be planted in drills 2 feet apart, 6 inches in depth, and 10 inches between the sets. Good varieties are Duke of York, Early Puritan, or Midlothian Early. The latter is a grand new variety, sent out by Messrs. Dobbie and Son, seedsmen to the King, Rothesay, Scotland, whose seed potatoes can be strongly recommended. Late varieties, although planted at the same time as the earlier kinds, continue growing until September. In a favourable season we have planted "Midlothian Early" (sprouted before planted) the first week in April, and have been eating them for dinner the second week in July, when early potatoes are so dear. Late varieties, if grown at all, should be planted in rows 2 feet 6 inches apart, and 18 inches between the sets. Good varieties are The Factor and Up-to-date. We hope to touch on the potato disease, and its treatment by spraying with "Bordeaux Mixture," a month or so hence.

Herbs are of such great use in a household that all the following should be grown in the general plot:—

Mint should receive first attention. Ask any boy who has some growing in his father's garden at home to bring a clump. Do not disturb the roots more than is necessary. Plant the clump early in April. It is partial to a good rich damp soil.

Parsley should be raised from seed sown in April. The seedlings should be well thinned. Each plant should be at least a foot apart in order to grow well. It makes an excellent border. To produce really good parsley, grow it in rich, moist, deep soil, and allow plenty of room between each plant.

Borage is perfectly hardy, and should be sown in April. It does well in stony soil, and is greatly loved by the bees.

Horehound does well if sown in April or May, in rows 18 inches apart. Thin to 18 inches between each plant.

Lavender seed may be sown in April. Thin out to 1 foot apart in a bed. When large enough, shift into its permanent place. It is often propagated by cuttings, which easily root.

Sage seed must be sown in light soil, and then thinned out to about 12 inches between the plants. The stock of this plant can also be increased by means of division or cuttings.

Thyme, Common, is easily raised by sowing seed, and also by division.

Thyme, Lemon, is grown from cuttings or division.

FLOWER CULTURE.

Sweet peas may be sown, although it is somewhat late. They may be sown in rows or clumps, and require similar culture as the culinary peas, to which please refer. Their further treatment will be touched on next month.

Annuals.—April is the month for the sowing of annuals. The name "annual" is applied to a plant which is sown, flowers, seeds, and dies in the course of twelve months. Annuals should find a place in every school garden. They may be sown in rows or groups. A simple way for the lads to grow them is to make a circle by pressing the top of an ordinary pail tightly into the soil, and then scatter the seeds thinly inside this circle; cover with fine soil, and thin as they come up.

Dahlia roots that have not commenced to grow may be planted out at the end of the month. For years I have planted them out in the following manner:—A hole is dug from 18 to 20 inches in depth, and 2 feet across. A layer of 6 inches of well-rotted manure is thrown into the hole, and trodden firmly at the bottom; 2 or 3 inches of fine soil on top of the manure, and the dahlia tubers placed on the top. The hole is then carefully filled up, so that the growing points of the dahlia are a few inches below the soil when raked level. On the top of the soil a couple of pails of sifted ashes are placed. Should the plant peep through before the 1st of June, place an inverted flower-pot over it during the night to protect the young growth from the late frosts. When all danger of frost is passed, carefully remove the ashes, and you will find the plant has started growth.

Calceolarias can be planted out towards the end of the month. They do best in a sheltered, shady position.

Ferns.—Any hardy ferns may be planted in a shady spot.

Sweet William may still be planted, and also *Canterbury Bells* and *Pentstemons*. *Hollyhocks* should also be put in. They require a sunny position and a richly manured site.

Pansy and *Viola* plants should find a place in the general plot. They do well as a border. Pansies prefer shade, but violas do well in either sun or shade. Both demand attention as to water, of which they require an abundant supply. Although these (especially violas) should have been planted in March, or even in the late autumn, I have planted as late as April, and on one occasion was awarded a silver medal at the Crystal Palace for blooms grown from violas planted out the first week in that month.

Michaelmas Daisies and *Phloxes.*—If the clumps are large, they may be lifted and divided with a sharp knife. Before replanting, see that the soil is enriched.

Roses.—The pruning of most standards, hybrid perpetuals, china and moss roses, should be finished the first week in April. The early part of April is the best time, however, for pruning teas and hybrid teas. In pruning roses, first cut away all dead wood, then cut back to a dormant bud which points outwards from the middle of the bush. Also cut away any thin stems, as the best blooms are always found on plump, clean, healthy branches. Also pay attention to the shape, and aim to grow a well-balanced head, especially in the standard variety.

Some teachers recommend a pruning knife for the work. No doubt the knife, especially if kept well sharpened, makes a cleaner cut. But it is somewhat dangerous in the hands of young lads. I have used sécateurs for years when pruning either fruit trees or roses of all kinds. Providing the blade is kept well sharpened, very little bruising takes place if the sécateurs are used carefully.

FRUIT.

Strawberries should be kept free from all weeds. If this has not already been done, spread some strawy manure between the rows early in the month, to be followed by straw to keep the

AFTER PRUNING STANDARD ROSE TREE.
(From a photograph; copyright of the author.)

berries clean; otherwise, if there should be heavy rains, the fruit becomes splashed with grit.

Raspberries may need weeding and tying. See that they are weeded with a fork, and on no account dig between the plants,

as their roots grow close to the surface of the ground. After weeding well, mulch with well-decayed manure. Raspberries are very gross feeders, and repay for good treatment.

Gooseberry bushes may be lightly dusted with lime, soot, or hellebore powder. This often keeps off the larvæ of the gooseberry moths. These pests, if not checked, quickly spoil the bush and the crop also.

Prizes Scheme.—A prize of Five Shillings is offered for the best "Scheme of School Gardening" approved by the Board of Education, and already being worked in a school, the Editor having the right to publish, if he thinks fit, the scheme awarded the prize. If desired, the names of the schools and the teachers working the schemes will be published. Readers are invited to send along any interesting photographs of school gardening. Should any reader meet with difficulties in the work in the school garden, the writer offers help through this column. If the letter is received by the Editor on or before the 5th of the month, it will be answered in the following monthly issue.

French Prize Competition.

1. All French translations **must be received not later than April 7, 1910,** and addressed to:—PRIZE EDITOR, Office of *The Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the *coupon* which appears on the Back Wrapper page of the current number. One coupon must be sent for each entry.
3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of **Half a Guinea** is offered for the best rendering into English of the following extract:—

Tous ces malfaiteurs, sans compter l'appui des grands, avaient de beaux privilèges. On en rencontrait quelquefois qui suivaient les routes, une croix à la main: à ceux-là il était défendu de toucher de par le roi et sainte Eglise; c'étaient des gens qui avaient *forjuré le royaume*. Quand un voleur, un meurtrier, un félon quelconque se sentait serré de tout près, il se jetait dans une église et se trouvait en sûreté. L'église était un lieu sacré, et quiconque en avait franchi le seuil était couvert par la protection de Dieu. En tirer les gens était un sacrilège qui emportait excommunication. Nicolas le Porter avait aidé à arracher de l'église des Carmes de Newcastle des laïques qui s'y étaient refugiés, et qui, une fois livrés à l'autorité civile, avaient été exécutés. Il lui fallut, pour obtenir son pardon, employer l'intermédiare du nonce du pape et se soumettre à une pénitence publique bien contraire aux coutumes d'aujourd'hui. "Nous ordonnons, écrit l'évêque Richard au curé de Saint-Nicolas de Durham, que les lundi, mardi et mercredi de la semaine de la Pentecôte qui vient, il aille recevoir en chemise, nu-tête et nu-pieds, devant le portail de votre église, en présence de la foule du peuple, le fouet de vos mains publiquement. Il y proclamera, lui-même, *en anglais*, le motif de sa pénitence et avouera sa faute, et quand il aura reçu ainsi le fouet, le dit Nicolas se rendra à l'église cathédrale de Durham, nu-tête nu-pieds et vêtu comme dessus; il marchera devant, vous le suivrez, et vous le fustigerez de même devant la porte de la cathédrale, ces trois mêmes jours, et il y recommencera les déclarations que j'ai dites."

From "La vie nomade et les routes d'Angleterre au XIVe siècle," by J. J. JUSSERAND.

N.B.—*Forjuré* is an Old French word meaning "forsworn."—ED.

RESULT OF THE MARCH COMPETITION.

The prize is awarded to "Peter Pan." (Will "Peter Pan" kindly forward name and address for publication?)

First Class.—Jim, Caen, Ivanhoe, Shakespeare, Trans, Ruth, Rusticus, Colenso, Flooded out, Bilcat, Ravenscraig, Etudiante, Kettering, D. M., Old Joe, W. M. E., Clapham, Thelma, Mr. Pickwick, Æneas, Pixie, Holt, Grimbarian, Hunter, A. C., Kenilworth, K. B., Daphne, Kalmar, Little finger, Fiat lux, Havashot, Leonard, Rachel, Nellie, Ariel, Greeba, Choc, Charles I., H. Q. L., Cambréssenne, Napoléon, Pine, Jean Bonhomme, Lily, Tiro, Patti, ——, Romany, Zif, Anglia, Blackwater, Maggie, Viva, A. J., Paresseuse, Max, Broughton, Colomba, Ecila, Mena, Essex.

Second Class.—Thrums, Madame de Maintenon, Borealis, Georgius, Sunshine, Sycophant, Cupido, Plathomme, Samivel Weller, ——, Griffith, Véronique, Primrose, Cornubia, May Cruttenden.

The name and address of "Noel" to whom the prize for the January competition fell, are:—Miss Kate Page, St. Margaret's Schools, Streatham Common, S.W.

REPORT.

The piece set was somewhat too easy to allow of any great differences showing themselves between the first dozen of the best translations. "Peter Pan" is, on the whole, the best, although a little too painfully accurate, and therefore somewhat wanting in ease. *Chevalier voyageur* is not "knight errant," but simply a "knight on his travels." The most frequent fault in the papers I have corrected was the translation of *on* by the indefinite "they," and not a few committed the dreadful solecism of translating *les seigneurs qui n'étaient pas en querelle* by "the nobles *that* were not at variance."

PRIZE TRANSLATION.

It is hardly necessary to call to mind that hospitality reigned in the castles also. Nobles who were not engaged in quarrels used willingly to entertain each other; between them there were links of fraternity very much closer than those which now exist among people of the same class. 'Tis but seldom to-day that we give a lodging to any one who may knock at our door. At the most—and that rarely—in the country, one may allow poor travellers to pass the night in a hay-loft. In the Middle Ages, people used to welcome their own class, not from simple charity, but by polite custom, and also for pleasure. Whether he were known or unknown, the travelling knight seldom found himself refused the entrance to a manor. His coming, in time of peace, was a happy relief to the monotony of the days. In those days, in each dwelling, there would be found the Hall—the great room in which meals were eaten in common. The newcomer would eat with the lord, at the cross-table arranged at the top end of the room, upon the place called the dais, his retinue at the low tables which were placed in the other direction—parallel with the walls of the room. When supper was finished, every one almost immediately would retire to sleep: folk used to go to bed and rise early in those times. The traveller was wont to withdraw, sometimes into a special guest-chamber, if the manor were large; sometimes even into that of the master of the house—the Solar, an apartment upon the first floor—and there used to pass the night with him. During this interval the low tables in the hall had been removed, for as a rule these were not fixed, but movable. Sleeping conveniences had been arranged upon the floor, over the litter of rushes with which day and night it was bestrewn, and upon them the people of the household, the retainers of the traveller, the stranger of less importance, would stretch themselves till morning.

"PETER PAN."

Papers for Teachers of Infants.

A CORRELATED SCHEME BASED UPON ÆSOP'S FABLES.

BY THE HEAD MISTRESS OF ST. WILFRED'S INFANTS SCHOOL, HULME, MANCHESTER.

"The Fox and the Crow."

ONE day a hungry fox saw a crow with a large piece of cheese perched on a tree. Wishing to get the cheese for himself, he drew near, and addressed the crow thus: "My dear friend, I never knew till to-day what a very handsome bird you are. Your feathers are so black and glossy, they shine like satin. There is no bird to compare with you." The crow was greatly delighted with this praise, and would have liked very much to say something in return, but durst not open her beak lest she should drop the cheese. Seeing this, the fox changed his tactics, and began to praise her voice. "I have been told,"

said he, "that a crow can sing much better than a thrush or a nightingale. Now that I have seen your beautiful feathers, I feel sure that this must be true. I have never heard a crow sing, and I should be so glad if you would just let me hear a few of your sweet notes." The vain crow quite lost her head on hearing these fine words, and opened her mouth to give a loud caw. Of course the cheese dropped from her beak, and the cunning fox seized it at once. "Ha, ha," laughed he, as he ran off; "my fine bird, your silly vanity has cost you your dinner. Next time do not be so ready to believe everything that is said."

Reading.

Æsop's Fables. "A. L. Bright Story Readers."

Object Lesson.—A Window.

Illustrations.—Cord, weight, and pulley; glass of lime water; glass tube; putty.

Preparation.—Connect with tale. Where did the crow get the cheese? How did he see that there was a piece of cheese on the kitchen table? How did he get into the kitchen? Could he have got in if the window had been shut? Could he have seen the cheese if the window had been shut?

Presentation.—By questioning, lead children to suggest—

1. *Uses of window.*

(*a*) *To admit light.* As a rule, the teacher will be obliged to vary her questions, and make use of such examples as a comparison between the darkness of the cellar and the brightness of the schoolroom before the children will give the desired suggestion. The idea of *seeing through* the window is uppermost in their minds.

(*b*) *To exclude cold, rain, snow.* In teaching this point, lead the children to see that while an opening in the wall would admit the light, it would not exclude the cold and wet.

2. *Parts of a window.*—These should be named by the children. They should name the material of which each part is made, and should be led to suggest suitability of material to use.

3. *How windows are glazed.*—Children should suggest each step in the process. Teacher should show putty and glazier's diamond. Cut a piece of glass before the pupils.

4. *Why windows should be opened.*—Show glass of lime water. Lead children to notice how clear it is. Let child sip some, and so suggest that it is not pure water, but that there is something in it. Make child blow into it through glass tube. Class will note milky appearance. Tell children that this change is due to some poison that is in the breath. By questioning lead children to see—

(*a*) If we are always breathing out this poison, the air round us must soon get full of it.

(*b*) That we must get rid of this bad air.

(*c*) That the best way to get rid of it is by letting in fresh air.

5. *How windows open.*—Show cord, pulley, and weight. Give simple explanation of how weight balances window. Make children notice sash cord. Tell them where weight is. Explain danger of opening window if sash cord is broken. Make children notice how windows in school open. Tell them that sometimes windows are made to open like a door.

Reading.

May White had hurt her foot, and could not go to school. She liked to sit in the big chair by the open window and look out into the street. One day mother said to her, "I think there is something wrong with the sash cord, May. You had better not open the window to-day till father sees it." Now I am sorry to say May did not always do what she was told, and you will see what happened to her. Her mother went upstairs, and May saw through the window a man with an organ and a monkey. At once she pushed up the window; but, oh! it fell down with a big crash, and caught poor May's hand. Oh, how she screamed! Her mother ran downstairs, and got her hand out, but it was so badly crushed that it had to be kept in a sling for a long time. Poor May! she always did as she was told after that.

Object Lesson.—Glass.

Illustrations.—Sand, chalk, soda, sketch of pot for making glass and of furnace.

Preparation.—Children should give various uses of glass. In each instance teacher should make the children see how the qualities of glass render it suitable for the particular use given.

Presentation.—Descriptive.—Teacher to show sand, chalk, soda, describing how these are mixed (omit quantities) and put in pot, sketch of which to be shown. These pots are then put into a furnace, and kept there for two or three days.

Reading.

(*How men found out the way to make glass.*)

Long, long ago there was a big storm, and a ship struck on a rock and was wrecked. Some of the poor sailors got to the land. They were very cold and wet, and looked round for something to make a fire. They found some very old seaweed, and making a hole in the sand they lit a big fire. In the morning they found some lumps of bright stuff among the ashes. Now these sailors were very clever, and they began to think how these lumps could have got there. They got some more seaweed and sand, and burned them again, and at last they found out how to make glass. Were they not clever?

Object Lesson.—Thrush.

Illustrations.—Picture of thrush; sketch of thrush breaking snails; picture of lark.

Preparation.—Connect with tale.

Presentation.—Comparison between lark and thrush.

Points to be Noted.

1. *Both are singing birds.*
2. *Difference in size.*
3. *Difference in beaks.* Beak of thrush stronger and thicker than beak of lark. Show picture of thrush breaking snail's shell.
4. *Spots on breast of thrush.*
5. *Crest on head of lark.*
6. *Difference in claws.* Claws of thrush shorter and more curved than those of the lark.

7. *Difference in habits.* Lark builds nest on ground, thrush in a thick bush.

8. Lark sings while flying. Thrush sings perched on a tree.

Reading.

One day Tom Smith went with his father for a long walk in the country. As they were resting under a hedge they heard a bird sing, and Tom's father showed him a dark brown bird with a spotted white breast sitting on a low bush. "That is a thrush, Tom," said he; "it is one of the best song birds." Tom listened till the bird had finished his song. Then he said, "O father, I wish I could catch that bird; I would get a nice cage for it, and take such care of it." "Ah, Tom!" said his father, "if you were to put that thrush in a cage you would be very cruel, and the poor thrush would soon die." "But, father," cried Tom, "Mary White has a nice canary in a cage, and he sings all day long." "Yes, Tom, but the canary has always lived in a cage, and does not mind it; but if you shut up one of our wild song birds, it cannot be happy, so I hope you would not be so cruel." "No, father," said Tom, "I never will."

Recitation.

"CRUELTY."

A little thrush was singing,
  High in an old oak tree;
How joyous was his carol,
  And sweet as sweet could be!
A light spring rain had fallen,
  The earth was fresh and fair;
The brilliant sun was shedding
  Its brightness everywhere.
The fields were starred with daisies,
  With blossoms white the thorn;
The woods were gently rustling
  In the breeze of early morn.
Through all this scene of beauty
  This happy bird could roam,
Free as the winds of heaven,
  The wide world was his home.
At evening in a city,
  'Midst smoke and dust and roar,
A poor caged bird was hanging
  Above an open door.
The thrush that sang that morning,
  A joyous, happy thing!
Was now a pining prisoner,
  With drooping head and wing.
No more was heard his singing;
  A week had scarcely sped,
When his little heart was broken—
  The woodland thrush lay dead.

TUTORIAL COLUMN FOR THE ELEMENTARY CERTIFICATE OF THE NATIONAL FROEBEL UNION.

INTRODUCTORY.

THE following questions have been set in previous years at the National Froebel Union Examinations. Extracts from the Examiners' reports upon the various subjects are also given for the help and guidance of students.

1. *Knowledge of Child Nature.*

Examiner's Remarks.—The weak point was the absence of an elementary acquaintance with the physiological basis of child development; this was most apparent in connection with the subjects of fatigue and immaturity in childhood. As a result, candidates are unprepared to deal intelligently with these physiological conditions in their future work.

(1.) For what reasons would a more extensive employment of their natural activities in children of infant-school age be beneficial to mind and body? Would reasonable opportunities for the exercise of these activities be compatible with discipline, and in what directions should they be guided?

(2.) Give reasons for the statement that physiological development in childhood is associated with conditions of immaturity, instability, and irregularity of growth.

(3.) Give illustrations of the value of a general knowledge regarding the characteristics of children at different periods.

2. *Practice of Education in Kindergarten and Transition Classes.*

(1.) How far do you regard age as the proper basis of classification in a kindergarten? What other circumstances would you take into account in classifying a new pupil?

(2.) "Nothing is more absurd than to suppose that there is no middle term between leaving a child to his own unguided fancies, and controlling his activities by a formal succession of dictated directions." Comment upon this passage, so as to bring out its application to the kindergarten, and illustrate your answer by reference to a suitable game for children five years of age.

(3.) What do you regard as the true aim of "occupations" in the kindergarten? What common mistakes must be avoided, in order that the educational value of "occupations" may not be sacrificed? Give examples to illustrate your statements.

3. *Class Teaching.*

Examiner's Remarks:—

Nature Lessons.—In the Nature lessons there was not enough time for quiet and, to some extent, directed observation. There was constant questioning by the teacher, and also needless telling. Faith is needed in letting the children teach each other, by giving them opportunities to observe and discuss together during part of the time at their own pace. The teacher's conversation should be an *adjunct*, not a *rival*, to the sense impressions she provides, and candidates therefore should not attempt beforehand to plan the order of the Nature lesson in too great detail.

Stories.—These are too often chosen from a mistaken idea of correlation instead of literary merit. It would be well if candidates could realise (*a*) that correlation is not a matter of word

connections, and (*b*) that literary merit is an even more crucial test of the value of a story. Candidates might be warned *not* to go to prepared cycles of lessons for their stories, but straight to the literary source. If they would study the methods of great story-tellers, such as Kipling, Kingsley, etc., they would undoubtedly improve.

Games.—When self-activity on the part of the children was the leading principle, the games were more or less good. But the teachers need more dramatic feeling in the planning with the children, and more faith in the capabilities of the children to carry out what they try to carry out for them. Of the games carrying out the idea of a Nature lesson and involving the singing of set words, the most successful were old favourites such as Froebel's "Pigeon House" and "Snail Game." Many "Nature" games devised in the supposed interests of "correlation" were feeble in the extreme, and were politely suffered rather than enjoyed by the children.

Handwork.—The fault of the handwork lessons was over-direction, the candidates aiming at good results rather than at providing scope for thought and originality, and at encouraging trial and experiment.

4. *Blackboard Drawing.*

Examiner's Remarks.—A large number of candidates fail in producing clear, bold outline of sufficiently large size to be useful, and also in maintaining correct proportion in enlarged sketches.

(1.) *Memory Drawing*:—
(i.) *Plants.*—Buttercup, peapods, elm leaves, or tomatoes; wildrose, barley, pine, or gooseberries; wallflower, cabbage, oak leaves, lemons.
(ii.) *Animals.*—Mole, earthworm, plaice, or sparrow; squirrel, bee, lobster, or hen; cat, house fly, minnow, or sea-gull.
(iii.) *Objects.*—Hatchet, bowl, saucepan, scissors, bee-hive, candlestick.
(2.) *Model Drawing.*—Draw, from the models placed before you, a chair and a pail standing on the floor by it. Eye-level must be indicated in the sketch.
(3.) Make an enlarged sketch of the spray of pinks with which you are provided.
(4.) Sketch one illustration which would be useful in a lesson on the fisherman and his work, or one for a lesson on volcanoes.
(5.) Make an enlarged drawing of the small sketch given below.

5. *Nature Knowledge.*

Examiner's Remarks.—The chief fault seems to lie in candidates depending on book knowledge imperfectly understood, and in a lack of personal observation. Such animals as a cat, snails, slugs, and their eggs, cocoons and chrysalids, could all with very little trouble be studied at first-hand; and then such errors as that a cat smells with its whiskers, and that snails change their shells, could not occur.

Many candidates failed to give a satisfactory description of the stamens and pistil of the flower provided, and had evidently made no use of a pocket lens. It would be well for future candidates to pay more attention to the essential organs of a flower.

(1.) *Plant Life*:—
(i.) What is the work of the *root* of a plant, and how is this work carried out? What different forms of roots are to be found? Give examples, and make a rough sketch of each.
(ii.) Arrange a series of four lessons for children of six or seven on *roots*. Indicate the special points for each lesson and the time required. Give the details fully of one of the lessons.
(iii.) State the special points you would take in giving a course of four lessons on spring flowers to children seven years of age.
(iv.) Write fully what you know about the process of *evaporation*. Distinguish between *evaporation* and *boiling*. Why does the hand feel cold when moistened with scent?
(2.) *Animal Life*:—
(i.) What is a *ruminant*? Give as many groups of ruminating animals as you can, and the habits of one.
(ii.) How would you stock a small aquarium to be kept in a classroom? What steps would you take to make it a real basis for Nature Study?
(iii.) What observations can children make concerning the mode of breathing in fishes? How would you supplement these observations to explain, in a simple way, the breathing apparatus of a fish? Give examples of vertebrate and invertebrate animals which breathe as aquatic animals at one period of their life, and as terrestrial animals at another.

6. *Educational Handwork.*

Examiner's Remarks:—
Brush Drawing.—A good many candidates had very vague ideas as to the teaching of the subject, while others treated it as a formal mechanical exercise. Candidates do not sufficiently study ways and means by which painting lessons may be more used for colour training. There is still too great a tendency to regulate the use of the brush.
(1.) Describe some of the possibilities of a heap of sand that can be used dry or damp; alone, or in conjunction with other material, if necessary.
(2.) Suggest, in some detail, suitable material for constructive work in building, and show how children might use it naturally and profitably. Give the age.
(3.) How would you endeavour to train the colour sense of a child?
(4.) Why, in your opinion, should coloured chalk be used by children? How and for what purposes would you let them use it?

In the Garden. By J. Eaton Feasey. (Sir Isaac Pitman and Sons, Limited.)

No part of the practical movement in education is more helpful than that which deals with school gardening, and those of our readers who require guidance in this matter could not do better than make constant use of this volume, which is well planned, well written, and well illustrated.

THE BOYHOOD OF JESUS AT NAZARETH.
(From Nelson's Bible Wall-Pictures.)

SCRIPTURE LESSONS FOR YOUNG CHILDREN.

THE STORY OF JESUS—*Continued.*

BY MRS. FLORENCE KIRK.

1. THE BOYHOOD OF JESUS AT NAZARETH.

Introduction.—The teacher should begin the lesson by referring to life in Eastern lands, as suggested in the issue for November 1909, and should try to enable the children to picture in their minds the surroundings and home life of Jesus.

The country in which Jesus lived was divided into three portions, named Galilee, Samaria, and Judea. Compare with the division of this country into counties, and show how the mode of speech varies. Compare and contrast people living in the north with people living in the south—those living by the sea with those living inland—those in the plains with those in the hilly districts, and so on.

Bethlehem, where Jesus was born, was in Judea, and so was Jerusalem, where the beautiful Temple was, and where the king lived.

You remember in the last story that Joseph and Mary went to live in Nazareth to escape from the jealousy of the king, because it was a long distance away, being much farther north. It was in that part of the country named Galilee, and was a very beautiful region, with hills and valleys, rivers, and streams, and lakes.

The district around Nazareth was specially rich in natural beauties, being hilly and well wooded, and with fertile valleys which supplied rich harvests of wheat.

The village itself lay in a little dale on the side of a hill largely composed of limestone. From the top of the hill a magnificent view was obtained of the surrounding country, with its gardens, cornfields, and streams. Close to the village was the well, where every evening the women came with pitchers on their heads to draw water, and to talk together respecting the events of the

day. (Get the children to close their eyes, and see this picture in imagination.)

Family Life of Jesus.—Although Joseph and Mary were working people, they were not *very* poor, for their mode of life was so simple, and their wants so few, owing to the climate and natural resources of the country, that life was not a burden. Jesus worked as a carpenter, and it is thought that He assisted Joseph (see Matt. xiii. 55), and helped to make ploughs, ox-yokes, and other implements.

He had a very happy childhood, and loved to roam about the country and enjoy the sights and sounds of Nature. He was fond of joining in the games with His playmates; but His heart longed for other things, and often when His work was done He would ask His mother to read to Him from the Scriptures, and tell Him about His Heavenly Father.

In those days there were no schools, so that Jesus must have learnt to read from Joseph or Mary. He was very regular in His attendance at the synagogue (the place where people met to worship God), and learnt many things that were written in the Scriptures; for, as the Bible says, "The child grew and waxed strong in spirit, filled with wisdom: and the grace of God was upon him."

The Picture.—Here show the picture, and call the attention of the children to the various details—for example, the typical clothing—sandals, turban, gown, etc.—the structure of the house; the absence of glass in the windows, and the strong sunlight, causing sharp shadows; the vine growing up the outside, and showing above the edges of the window; the palm trees and sandy soil outside; the white appearance of the low houses, with their tiny windows and flat roofs; the cloudless blue sky; the occupation of Mary and Joseph. Mary is evidently spinning silk, probably from silk-worms reared by herself, and Joseph is following his trade as a carpenter.

2. Jesus in the Temple at Twelve Years of Age.

It was the custom of the Hebrews to celebrate the Feast of the Passover at Jerusalem if possible, and the parents of Jesus used to go every year to Jerusalem for this purpose. On these occasions a number of persons joined to form a caravan—for safety and for company—the journey being made on foot, and on the way they used to sing sacred songs. The stay in Jerusalem extended over eight days. Very young children were not taken on these journeys (why?), but at the age of twelve a boy was considered to be grown up, and was then allowed to join in the festival.

When Jesus was twelve years old He was taken by Joseph and Mary to Jerusalem, and great was His joy at seeing so many new and wonderful things. The services in the Temple were a great delight, and He joined in them with heart and mind and soul so thoroughly that the days passed all too quickly.

At the end of the time, Joseph and Mary set out on their homeward journey, but Jesus stayed behind, unknown to them. When they missed Him they thought He must have gone with some other members of the company who had left a few hours earlier, so they hastened on their journey to overtake them. When they reached the first stopping-place, and came up with the caravan, they inquired for the Boy in vain—no one had seen Him.

They hurried back with all speed to the house where they had been staying; but He was not there, and no one knew anything about Him. After searching for three days they ascended the mount of the Temple, passed through the outer buildings, and at last found Him with some other boys in a room where the Rabbis, or learned men, were explaining the law as given in the Scriptures. Jesus was listening intently to their discussions, and sometimes asking them questions. They also asked Him questions, and were astonished at the knowledge and understanding He displayed.

Joseph and Mary looked on in amazement, and then made their way to Him. Mary threw her arms round Him, so glad was she to have found Him, and reproached Him gently for His conduct, saying, "Son, why hast thou thus dealt with us? Behold, thy father and I have sought thee sorrowing." Jesus seemed to think they might have known His desires, for He replied, "How is it that ye sought me? Did you not know that I must be in my Father's house?" Without begging to be allowed to stay a little longer, Jesus followed them from the Temple, and they set out once more on their homeward way; and never again, as long as He lived with them, had they need to reproach Him, for He always remained a dutiful and obedient son: but Mary often thought of His words, and wondered what the future had in store for Him.

The Boy Jesus in the Temple.
(From Nelson's Bible Wall-Pictures.)

The Picture.—Compare this picture of the Temple with the one where Jesus was a baby. Draw attention to the structural details—the pillars supporting the roof; the marble floor; the mosaics and paintings on the walls; the latticed and carved screen. Draw attention to the dress and curious headgear of the Rabbis—the scroll from which they are reading the Scriptures. A very interesting lesson can be given by roughly tracing the evolution of the modern book from the early sand table and waxen tablet to the parchment on rollers, and then to the vellum and paper leaves. The direction of the writing—up and down instead of from left to right—should be demonstrated, and also the manner of rolling up the scroll. For this a school modulator makes a very good illustration.

N.U.T. NOTES.

BY ALLEN CROFT.

DURING my fifteen years' membership of the Executive, I have witnessed many remarkable assemblies at Bolton House, but never one more notable than that gathered within its portals on the last Saturday in February, to consider the following all-important professional questions:—

With the Principals.

(*a*) Degree course students in training colleges—the attitude of the Board of Education.
(*b*) The employment of ex-students.
(*c*) The discontinuance of the "Acting Teachers'" Examination.
(*d*) Examinations qualifying for admission to a training college.

Between forty and fifty principals of training colleges attended the conference, and naturally the greater portion of the time available was absorbed by the degree question. Mr. F. Roscoe, from the Birmingham University, introduced the topic in an admirable speech bristling with point and humour; and other valuable contributions to the debate were forthcoming from Dr. Workman, Dr. Richardson, the Rev. H. Wesley Dennis, Prebendary Hobson, Professor Mark Wright, Sir H. R. Reichel, the President of the N.U.T., and Mr. Ernest Gray. Ultimately it was resolved, on the motion of the Rev. H. Wesley Dennis, and Mr. J. H. Gettings—

"That a sub-committee of this conference be appointed to consider what steps can best be taken to collect information, and suggest immediate action, in reference to the special pressing difficulties in the training and certification of teachers."

Prebendary Hobson dealt very effectively with the employment of ex-students; whilst I had no difficulty in securing assent to the motion—

"That the present abundant supply of trained certificated teachers justifies the demand for (*a*) the abolition of the Acting Teachers' Examination; (*b*) the gradual restriction of employment in elementary schools to certificated teachers."

There was no time for discussion of question (*d*) quoted above, and it was referred to the committee appointed by the conference.

THESE lines will barely have been published when the Forty-first Annual Conference of the N.U.T. will be declared open by Mr. C. W. Hole, the retiring President. I am unfeignedly thankful that no Education Bill will this year disturb and absorb our public sessions, for the arranged agenda teems with educational questions of vital concern to the people of our country. The Executive has the right to select the *first* subject to be considered at each public session, and few will object to "further financial aid" being placed in the very forefront of our programme. My colleague in the representation of the North Midlands constituency, Mr. W. B. Steer (who is also the Vice-Chairman of the Education Committee), has the honour of opening the discussion; and, indeed, few men have gone into the subject more deeply and carefully than he. I confidently anticipate that at Plymouth Mr. Steer will enhance his already high reputation.

Ready for Plymouth.

The first business for Wednesday morning relates to the "Supply of Teachers," a question which has forced itself very greatly to the front during the past twelve months, partly through the fearful suffering and anxiety undergone by several hundreds of young men and women inveigled into the teaching profession by specious promises, and misleading (not to say lying) pamphlets; and I rather expect to hear a few caustic references to the miscalculations of the Board of Education's officials, and to their apparent indifference to the results.

"Continuation Schools and Child Labour" is the first topic for Thursday morning, and has been entrusted to Mr. W. A. Nicholls (ex-President) and Mr. T. H. J. Underdown, two men who, from their zeal and earnestness, have deserved the honour and distinction of once again fighting the children's battles.

The purely domestic business of the Union seemed to the Executive capable of being adequately and completely dealt with in *two* private sessions; and, so far as my experience enables me to judge, nothing very exciting is likely to occur.

AN EMINENT PHYSICIST.

THE death at Marburg of Professor F. W. Kohlrausch has removed an eminent physicist.

Kohlrausch, who was born in 1840 at Rinteln-am-Weser, was an example of hereditary genius. His father, Rudolph Kohlrausch, in conjunction with Weber, carried out for the first time a determination of the relation between the electro-magnetic and the electro-static units of electric quantity, thus laying the foundation of the absolute system of electrical units.

His son, educated at Göttingen, subsequently became professor at that university. From there he went to Frankfurt-am-Main, Würzburg, and in 1895 became President of the Reichanstalt at Charlottenburg. He was a member of the Royal Society of London, and of the Physical Society.

His chief contributions to science dealt with the measurement of electrical and magnetic quantities. Among these were the absolute measurement of H and of the strength of an electric current by simultaneous observations of the deflection of the needle of a tangent galvanometer and of a suspended coil, when both instruments were traversed by the same current.

In 1874 he carried out a series of observations on the determination of the absolute value of the "Siemen's Unit" of electrical resistance. The results which he obtained had the effect of further directing attention to the previous results of Maxwell in 1863 and 1864.

In 1871, Kohlrausch introduced a method of measuring the resistance of electrolytes by using alternating currents, generated by the revolution of a magnet inside a coil. In this way the effects of polarisation of the electrodes were largely eliminated.

Later, the induction coil was used as the method of generating the alternating current.

These experiments had the effect of starting a long series of experiments on the conducting power of electrolytes.

In 1871, Kohlrausch published his *Leitfaden der praktischen Physik*. This work, designed for the systematic instruction of the student in practical laboratory work, was the pioneer work of the movement which has culminated in the widespread physical laboratory practice of the present day.

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A SCHEME OF CORRELATED HISTORY AND LITERATURE.

SCHEME FOR APRIL—NORMAN AND PLANTAGENET.

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Grade I.—Standards I. and II.	Grade II.—Standards III. and IV.	Grade III.—Standards V.-VII.
History— Story of Anselm the Good. The sons of the Conqueror. The *White Ship*. Story of Matilda, the Lady of the English. Becket the Martyr.	Story of Anselm the Good. England under Stephen. Richard Strongbow. Becket the Martyr. The good reign of Henry II.	Biography of Anselm. England under Stephen (contrast with Henry II.). Biography of Becket. The wars of Henry Plantagenet. The reforms of Henry Plantagenet. Maps of Henry's possessions should be made by this grade.
Literature— (*To be told to the Children.*) Story of Ivanhoe.	As for Grade I. Selected passages, such as the one quoted below, to be read aloud to the class.	(*To be read by the Children.*) *Ivanhoe*. Good abridged editions by Nelson, 3d. or 4d.; Blackie, 4d.; Collins, 4d.
Poetry for recitation and for reading aloud to the class. He never smiled again. The death of William Rufus. *Ballads of British History I.* Nelson, 3d.	Richard at the bier of his father, and others as for Grade I.	Selections from Tennyson's "Becket." "St. Thomas of Canterbury," by J. E. Parrott (*Ballads of British History I.* Nelson, 3d.).

Teacher's Reading.

Scott's *Ivanhoe* should be read in full. *The Talisman* or *The Betrothed*, to be used next month, might also be begun; also Eadmer's *Life of Anselm* and Tennyson's *Becket*. The translation of Layamon's *Brut* and Taylor's translation of the *Roman de Rou* are out of print, but extracts from these may be read in *A First Book of English Literature I.*, published by Horace Marshall at 2s. 6d.

Readings in English History II., published by Blackie at 2s. 6d., gives some very good selections from Giraldus Cambrensis on Henry the Second's conquest of Ireland; also the story of Becket, quoted from the two contemporary historians, Roger de Hovenden and Roger of Wendover, and a Norman account of the most noble City of London, by William FitzStephen.

Notes on History.

The most important figures in the history of this period are Anselm, Becket, and Henry II. The reign of William Rufus requires but little attention beyond that given to it in the story of Anselm. The Charter of Liberties of Henry I. is important for Grade III.

The reign of Stephen should be taken as typical of the conditions created by a weak ruler in unsettled times. Stephen was not the right man to hold the reins of government firmly and wisely. The barons became all-powerful, building strong castles, and employing troops of mercenaries to fight their wars. These strongholds became veritable dens of iniquity, where robbery, oppression, and torture were resorted to without hindrance or interference from the State. All order was swept away, and no one's life or property was sacred except by his own strong hand. The condition of the poorer people, especially, was indescribably wretched. It was the reign of anarchy. The *Chronicle* says: "Never yet was there such misery in the land; never did the heathen men worse than these Christian barons. Christ slept, and all His saints." To add to all this misery, civil war broke out in 1139, many of the barons declaring for the Empress Matilda—who landed in England, supported by Robert Earl of Gloucester—at whose court the young Prince Henry was brought up. For some time Matilda gained ground, but her success became the cause of her final loss; for her temper, naturally proud and haughty, became so overbearing and arrogant that even her firmest adherents were eventually alienated. At last she was besieged in Oxford, and had to escape disguised to Wallingford, from whence she proceeded to Normandy to gain recruits, while Stephen made vigorous attempts to consolidate his kingdom. Young Prince Henry now took his cause into his own hands, and at the invitation of some English barons came over from Normandy to take possession of the throne in his own title. He had set out with a small but well-disciplined force, and on his arrival in England, and all along his route, he was joined by fresh adherents and considerable reinforcements. The very barons themselves were by this time tired of civil war; and, chiefly through the negotiations of the Church, the Treaty of Wallingford was drawn up without further bloodshed. This provided that Stephen should retain the throne during his lifetime, and that Henry Plantagenet should succeed him. This was a most popular treaty, and the people took heart and courage when Stephen and Henry made a royal progress together through part of the kingdom, being received with joy and acclamation everywhere.

The Reign of Henry II.

Reforms.—In the next year Henry succeeded to the throne, the first king since the Conquest to succeed in peace and without a struggle. He gave his immediate attention to the pressing needs of the country, pulling down many of the barons' strongholds, and expelling the foreign mercenaries. He himself travelled quickly throughout the country, sometimes in disguise, to discover the true state of affairs—hearing lawsuits, settling cases which judges had not tried properly, granting charters to towns, and seeing justice administered impartially. He established the assizes and trial by ordeal, suppressed false coinage, and instituted a money tax, in place of taxes paid in goods. This raised the value of money, and gave an impetus to trade. The result of these reforms was general prosperity. The land was

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tilled; swords were beaten into ploughshares; farms were safely stocked with cattle and sheep; and men might now travel peaceably throughout the length and breadth of the land. Monasteries sprung up once more, and became the centres of trade. The monks were leaders and teachers of the people, and under them men were taught all kinds of trades—to make roads, build mills, drain swamps, etc. Under a king like Henry, who was no mean scholar himself, knowledge and learning spread rapidly, and it is thought that the University of Oxford was founded in this reign.

Wars.—During his reign, Henry II. did his best to consolidate his kingdom by bringing Wales, Ireland, and Scotland into subjection.

Wales.—Three expeditions were made into Wales, where Rhys ap Gruffydd and Owen Gwynnedd did all they could to harass the English king. Eventually an alliance was made which brought peace, and Welsh soldiers served in Henry's armies towards the latter part of his reign.

Ireland.—The subjugation of Ireland was a daring experiment. The country was divided into kingdoms, each ruled over by a king of its own. Naturally these petty princes were always at war. At length Dermot, king of Leinster, was expelled from his kingdom by neighbouring princes, and he appealed to Henry for aid. In return for his homage, Henry sent Richard de Clare, called Strongbow from his daring prowess, to his assistance, with other English nobles and knights and their followers. By the aid of Strongbow, Dermot regained his throne, and in gratitude he gave Richard de Clare his daughter in marriage. Other English knights also took land for themselves, and settled in Ireland in large numbers. Then Henry crossed over to Dublin, and remained six months, receiving the homage of all the Irish princes save those of Ulster. The Irish bishops accepted Henry, and at the Synod of Cashel they agreed to bring their Church into conformity with the English Church. After Henry's return, Strongbow ruled for him with the help of Hugh de Lacy. Henry's plan of making Prince John "Lord of Ireland" was brought to nothing by the rash folly of that young prince, who insulted the Irish chiefs when sent to win over and conciliate them.

Scotland.—In 1174, William the Lion of Scotland invaded England and committed many savage and barbarous outrages. The men of the north stood firm, and meeting the Scots at Alnwick, took the Scottish king prisoner. When Henry returned from France he made Scotland a fief of the English crown, and the Scottish king, his brother, his barons, and free tenants all swore homage to Henry. After this, a firm hold was maintained over Scotland to the end of the reign.

Connections with Europe.—The connections of Henry II. with Europe should be clearly pointed out, and maps made to show our French possessions at this date. Henry's marriage was purely one of policy, by means of which his French possessions were largely increased; his daughters were married to the rulers of Saxony, Castile, and Sicily; his sons betrothed to Continental princesses and heiresses.

The End of the Reign.—Tell the story of the rebellion of Henry's sons against him, and trace the lack of real filial affection to the fact that the king used his children as pawns in his great political and national schemes; and though he had affection for them, they learned to fear rather than love him. Give an account of the death of Henry. When worn out with sickness the names of the rebels were read aloud to him, headed by that of his favourite son John. "Now let all things go as they will," he cried, as he turned his face to the wall; and passed away three days later with the words "Shame, shame on a conquered king" on his lips.

The story of the great Becket should be told in full, and how the people traced the disastrous end of Henry's reign to his treatment of the Archbishop of Canterbury. He rebelled against his spiritual father, and his sons punished him by their rebellion.

Henry's character should be drawn from the various events of his reign—statesmanship and practical sagacity, boundless ambition, love of justice, great ruling power, a leader among men; but hasty, violent, self-willed, with a wild strain in his blood inherited from his Plantagenet ancestors.

MODERN SCIENCE NOTES.

BY J. G. M'INTOSH, B.SC., SECONDARY SCHOOL, GATESHEAD.

"The Tail of a Comet."

SIR ROBERT BALL, writing in reply to a correspondent, who has expressed some alarm as to the consequences of a possible collision between the earth and the tail of a comet, says:—

"A rhinoceros in full charge would not fear collision with a cobweb and the earth need not fear collision with a comet. In 1861 we passed through the tail of a comet, and no one knew anything about it at the time. For a hundred million years life has been continuous on this earth, though we have been visited by at least five comets about every year. If comets could ever have done the earth any harm they would have done it long ago, and you and I would not be discussing comets, or anything else. So far as I can learn, we may be in the tail of Halley's comet about May 12, and I sincerely hope we shall. I think Sir John Herschel said somewhere that the whole comet could be squeezed into a portmanteau."

Probably Sir Robert Ball was thinking of the sentence in Sir John Herschel's *Outlines of Astronomy:* "The tail of a great comet, for aught we can tell, may consist only of a very few pounds or even ounces of matter."

Cowell, writing in *Nature* for February 3, gives a diagram of the orbit of the comet, and the position of the earth during the middle of May. The line of transit with the sun being on May 18, we shall then probably be passing through its tail. The approach to the earth at this time is so close that the idea has been conceived of weighing the comet by the deviation in the earth's orbit. Such a possibility is extremely remote, since it is probable that such a deviation will be one-thousandth of the least measurable quantity.

Speaking generally, each comet consists of a nucleus, an envelope (technically termed the "coma"), and a tail. It is probable that the nucleus consists of a heap of meteorites of varying mass, which can be so easily disintegrated that they are gradually distributed along the orbit of the comet, a process which eventually results in the destruction of the comet unless it restores its nucleus by gathering stray meteors.

That such a disintegration takes place is well known, and has actually been observed. In 1826, Biela's comet burst into two parts, which drifted a million miles asunder, and eventually became dissipated into meteors along its orbit. It now manifests itself in a meteoric

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shower whenever the earth crosses its orbit, which is, roughly, in every six and a half years.

The "coma" surrounding the nucleus measures from 20,000 to 1,000,000 miles in diameter. The tail streaming out from the nucleus varies from 6×10^7 miles to 10^8 miles or more in length.

It is about this "horrid hair" that "shakes with pestilence and war" that the chief astronomical and physical interest lies. As the comet approaches the sun violent internal action takes place in the nucleus, and the coma is formed. With closer approach the tail begins to form, ever increasing in brightness and length, projecting many millions of miles behind the comet. After perihelion a startling change takes place—the tail no longer trails behind, but projects in advance of the comet, as if some mighty solar hurricane were blowing it from the sun. No lady ever retired more gracefully from the royal presence than a comet from his Majesty the Sun. This phenomenon has long been a matter of speculation among scientists. Here is matter which, refusing to obey the pull of the sun, disobeys the law of gravitation! One of the first theories to be advanced was, that the result was probably due to tremendous electrical repulsive forces. That electrical force may play a part is probable, but more recently another theory has been advanced to account for the energy causing repulsion.

Lebedev first demonstrated that light exerts pressure on infinitely small particles. Nichols and Hull, improving on his methods, calculated that the earth sustains a light pressure of 75,000 tons. It is to this great force that Arrhenius first attributed the neutralisation of the gravitational energy of the sun, and the repulsion of the cometary tail.

To show the effect of this force on very attenuated matter, let us imagine we have a block of wood. There will be a certain amount of light pressure acting on its surface. Now saw the block in two: the mass is unaltered, but the amount of surface is increased. If this process be continued until the block is reduced to sawdust, the result will be that the total surface upon which light pressure acts will be immensely increased, while the total mass remains constant. Each particle of sawdust may therefore be considered as consisting of surface, and having small weight. Now imagine each particle to be further divided into invisible particles. It is possible to conceive a point of subdivision such that the light pressure exactly counterbalances the force of gravity, and the particle ceases to have weight, being perfectly balanced under opposing forces. Should the division be carried further, the particle will be hurled into space against the force of gravitation by the excess of light pressure. Such is the most recent theory which has been advanced to account for the formation of the tail and its behaviour. As the comet advances to the sun the hydrocarbons of the tail, under the intense heat generated, split into hydrogen and carbon in the form of soot. This soot cannot burn away, because the space is airless, and under the influence of the radiation pressure from the sun, it is thrown away from that body in defiance of the force of gravitation. Moreover, this theory affords a feasible explanation of the lightning-like changes in the length of a comet's tail. Arrhenius has calculated that a particle, one-half the critical diameter, can be flung out with a speed of 867,000 miles per hour. Particles of one-eighteenth the critical diameter, corresponding in size to the cometary dust, would be propelled over this distance in four minutes, so that the solar radiation may quite possibly produce the stupendous changes which have been noted at various times.

The Properties of Polonium.

Madame Curie and M. Debierne have succeeded in isolating one-tenth of a milligram of polonium. From experimental results the radio-active properties of polonium appear to be far greater than those of radium. It decomposes chemically organic bodies with extraordinary rapidity. Its distinctive quality is its rapid rate of disintegration, a particle of polonium losing 50 per cent. of its weight in 140 days. Radium, on the other hand, is characterised by its slow rate of transformation. The products of disintegration have been ascertained to be helium and another body, which Madame Curie and M. Debierne suspect to be lead.

Rutherford, in 1904, showed that polonium was in reality a transformation product of radium itself. Quite apart from the fact that pure polonium has been isolated and weighed, the chief interest in the recent research lies in the probable solution of the nature of the products of disintegration. The production of helium has been noted before by Rutherford in 1909. Boltwood several years ago suggested that the final product of the radium series was lead, and by comparing the amounts of helium and lead in old radio-active minerals gave strong circumstantial evidence in favour of this view. Rutherford points out that since polonium is the last of the active products of the radium series to be observed, it is to be expected that polonium should be transformed into helium and lead, one atom of polonium producing one atom of helium and one of lead. This point of view receives additional weight from consideration of the atomic weight to be expected from the end product of radium. By a simple calculation, Rutherford deduces the atomic weight of polonium from that of uranium as 210·5, the further loss of an α particle giving a product whose atomic weight is 206·5, a value very close to the atomic weight of lead. The further results of Madame Curie's experiments on this point will be watched with interest.

The New Method of Electroplating.

Since writing in last month's issue, I have had an opportunity of testing the results of the new method of electro-deposition which is being sold as "Galvanit." The process is really a refinement of the old contact method. In that method the metal which it was desired to plate was immersed in an electrolyte. In contact with this metal a more electro-positive one was placed dipping into the electrolyte. This metal, usually zinc, passed into solution, causing an electric current which, in its turn, plated out the silver on the less electro-positive metal.

In this process the electro-positive metal is in the form of a fine powder, chiefly magnesium. This is mixed with the metallic salt or powdered metal it is desired to plate out, and some ammonium salt. The magnesium, being highly electro-positive, reacts on the moist electrolyte, and goes into solution, causing the less electro-positive metal to be plated out on the surface which is being rubbed. Thus each minute particle of magnesium acts as an anode. I have found the process very satisfactory with small articles. There are numerous instances in the laboratory to which the process is applicable, chiefly in the prevention of rust.

For very large articles it would be difficult to obtain even deposition, and time would be a militant factor.

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I have presumed that you mean the cubical coefficient of expansion of water. This differs at different temperatures, and to test your result it would be necessary to know between what temperatures you worked. The mean co-efficient of expansion between those temperatures could then be given.

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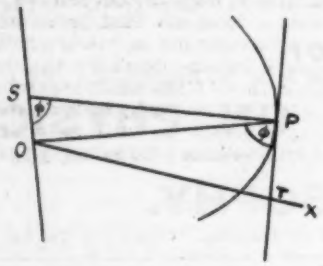
Comus.—Show that the locus of the extremity of the polar subnormal of the curve

$$r = f(\theta)$$

is

$$r = f'\left(\theta - \tfrac{\pi}{2}\right).$$

Let P be any point on the curve $r = f(\theta)$, PT the tangent at P, meeting the initial line OX at T. Draw OS perpendicular to OP to meet the normal at P in S. Then S is the extremity of the polar subnormal of P.



Let P be the point (r, θ) and S the point $(r_1\ \theta_1)$.

Then $r_1 = \text{OS} = \text{OP cot PSO}$

$= \text{OP cot OPT}$,

for $\angle$OPT is the complement of $\angle$OPS, as also is the angle OSP. In the usual notation therefore

$$r_1 = r \cot \phi.$$

But $$\tan \phi = r\frac{d\theta}{dr},$$

and since $$r = f(\theta),$$

$$1 = f'(\theta) \cdot \frac{d\theta}{dr}.$$

$\therefore$ $$\tan \phi = \frac{r}{f'(\theta)}, \text{ or } r \cot \phi = f'(\theta).$$

Hence $$r_1 = f'(\theta).$$

Again $$\theta_1 = \angle\text{SOX} = \tfrac{\pi}{2} + \angle\text{POX}$$

$$= \tfrac{\pi}{2} + \theta.$$

$\therefore$ $$\theta = \theta_1 - \tfrac{\pi}{2}.$$

Hence $$r_1 = f'\left(\theta_1 - \tfrac{\pi}{2}\right),$$

or the locus of $(r_1\ \theta_1)$ is the curve $r = f'\left(\theta - \tfrac{\pi}{2}\right)$.

Maths.—Show that the chord of curvature through the pole of the curve

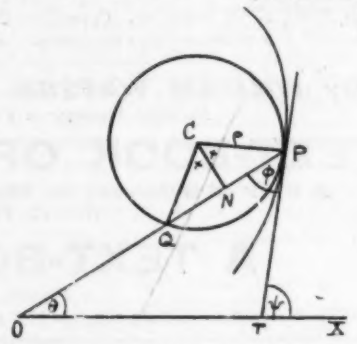
$$r^m = a^m \cos m\theta$$

is

$$\frac{2r}{m+1}.$$

Examine the cases when $m = -2, -1, -\tfrac{1}{2}, \tfrac{1}{2}, 1, 2$.

(Edwards' *Diff. Calc.*)



Let C be the centre of curvature of the point P. Join the pole O to P, meeting the circle of curvature at Q. Join CQ, and draw CN perpendicular to PQ. By elementary geometry QN = NP, and $\angle$QCN = $\angle$PCN. Draw PT the tangent to the curve at P, meeting the initial line at T. PT is also a tangent at P to the circle of curvature; hence the angle QPT is half the angle QCP at the centre.

Thus $$\angle\text{PCN} = \angle\text{QCN} = \angle\text{OPT} = \phi.$$

Hence the chord of curvature through the pole

$$= \text{QP} = 2\text{PN} = 2\rho \sin \phi. \quad \ldots \quad \text{(i)}$$

Now $$r^m = a^m \cos m\theta.$$

Thus $$mr^{m-1} = -ma^m \sin m\theta \cdot \frac{d\theta}{dr}.$$

$\therefore$ $$r^m = -a^m \sin m\theta \cdot r\frac{d\theta}{dr}.$$

$\therefore$ $$a^m \cos m\theta = -a^m \sin m\theta \cdot r\frac{d\theta}{dr}.$$

$\therefore$ $$\frac{d\theta}{dr} = -\cot m\theta.$$

$\therefore$ $$\tan \phi = -\cot m\theta.$$

$\therefore$ $$\phi = \tfrac{\pi}{2} + m\theta. \quad \ldots \quad \text{(ii)}$$

$\therefore$ $$\frac{d\phi}{d\theta} = m. \quad \ldots \quad \text{(iii)}$$

Again, $$\frac{1}{\rho} = \frac{d\psi}{ds} = \frac{d(\theta + \phi)}{ds}$$

$$= \frac{d\theta}{ds} + \frac{d\phi}{ds} = \frac{d\theta}{ds} + m\frac{d\theta}{ds} \text{ by (iii)}$$

$$= \frac{(1+m)}{r} \cdot r\frac{d\theta}{ds}$$

$$= \frac{1+m}{r} \cdot \sin \phi.$$

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Thus $$\rho \sin \phi = \frac{r}{1+m},$$

and by (i) the required chord of curvature is

$$2\rho \sin \phi = \frac{2r}{1+m}.$$

Case (1). When $m = -2$, the curve becomes

$$r^2 \cos^2 \theta = a^2,$$

which is the rectangular hyperbola

$$x^2 - y^2 = a^2.$$

The chord of curvature through the centre of a rectangular hyperbola is twice the distance of the point from the centre.

Case (2). When $m = -1$, the curve becomes

$$r \cos \theta = a;$$

that is, the straight line $x = a$.

As we should expect, the chord of curvature (as also the radius of curvature) is then infinite.

Case (3). When $m = -\frac{1}{2}$, the curve becomes

$$r^{\frac{1}{2}} \cos \tfrac{1}{2}\theta = a^{\frac{1}{2}},$$

or

$$r \cos^2 \frac{\theta}{2} = a;$$

that is,

$$\frac{2a}{r} = 1 + \cos \theta,$$

which is a parabola whose form is the pole.

Hence in the parabola the focal chord of curvature is four times the focal distance of the point of contact of the circle of curvature. The positive values of m present no difficulty—for example, $m = 1$, the curve is the circle

$$x^2 + y^2 = ax,$$

the origin is on the circumference. Since the circle of curvature of a circle at any point is the circle itself, we get the identity that a chord of a circle from a point on the circumference is equal to itself.

A word of advice may be useful here. The bookwork on curvature leads the student to imagine that the work consists of remembering and substituting in formulæ. This is very harmful, and results in the student not grasping quite elementary ideas. Every question should be worked out *ab initio* from a figure, care being taken that in the figure used all the quantities θ, r, ϕ, ψ, etc., are increasing together positively.

The *only* formula necessary for these examples is $\rho = \frac{ds}{d\psi}$, which is itself evident from the figure, being merely the fact that the arc of a circle is the radius times the angle subtended at the centre. Note carefully that $\psi = \theta + \phi$, which connects this formula with the polar notation. If you have any difficulty in using *ab initio* methods write again, and I will try to find room for a short explanation of the bookwork. The effort, in any case, will well repay you.

Fiat Lux.—A mass of 7 oz. is attached to the end of a light string which passes over a light, smooth, fixed pulley, and carries at its other extremity another light, smooth pulley. If a string passing over this second pulley carries masses of 3 oz. and 4 oz. at its extremities, determine the acceleration of each mass in the system.

Let the tension of the string connecting the 7 oz. mass and the movable pulley be T poundals, and the tension of the string which passes over the movable pulley T′ poundals.

Also let f ft./sec² be the acceleration of the 7 oz. mass down, and therefore of the movable pulley up; and f' ft./sec² the acceleration of the 3 oz. and 4 oz. masses *relative* to the movable pulley.

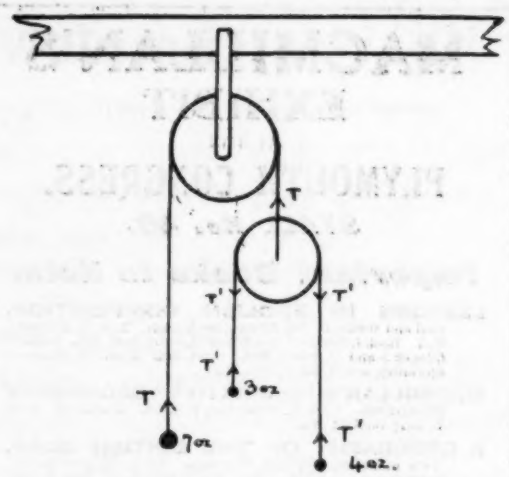
(*a*) The forces acting on the 7 oz. mass are its weight, $\frac{7}{16}g$ poundals down and T poundals up, hence

$$\frac{7}{16}g - T = \frac{7}{16}f \quad \text{(i). [Newton ii.]}$$

(*b*) Since the movable pulley is weightless, the forces acting on it are in equilibrium, otherwise its acceleration would be infinite, hence

$$T = 2T' \quad \text{(ii)}$$

(*c*) The forces acting on the 4 oz. mass are its weight $\frac{4}{16}g$ poundals down, and the tension T′ poundals.



Thus $$\frac{4}{16}g - T' = \frac{4}{16}(f' - f) \quad \text{(iii)}$$

(*d*) The forces acting on the 3 oz. mass are its weight, $\frac{3}{16}g$ poundals downward, and the tension T′ poundals, hence

$$T' - \frac{3g}{16} = \frac{3}{16}(f + f') \quad \text{(iv)}$$

Hence, subtracting (iv) from (iii)

$$\frac{7g}{16} - 2T' = \frac{f'}{16} - \frac{7f}{16},$$

and therefore from (ii)

$$\frac{7g}{16} - T = \frac{f'}{16} - \frac{7f}{16},$$

and from (i)

$$\frac{f'}{16} - \frac{7f}{16} = \frac{7f}{16}.$$

$$\therefore \quad f' = 14f.$$

Again, add (iii) and (iv)

$$\frac{g}{16} = \frac{7f'}{16} - \frac{f}{16}.$$

$$\therefore \quad 7f' - f = g.$$

Thus $$f = \frac{g}{97} \text{ ft./sec}^2,$$

and $$f' = \frac{14g}{97} \text{ ft./sec}^2.$$

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